# SOLAR EVAPORATION PONDS

# **CLOSURE PLAN**

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT GOLDEN, COLORADO

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VOL. III

ROCKWELL INTERNATIONAL NORTH AMERICAN SPACE OPERATIONS ROCKY FLATS PLANT

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# DEPARTMENT OF ENERGY ALBUQUERQUE OPERATIONS OFFICE ENVIRONMENT, SAFETY AND HEALTH DIVISION ENVIRONMENTAL PROGRAMS BRANCH

# COMPREHENSIVE ENVIRONMENTAL ASSESSMENT AND RESPONSE PROGRAM

### PHASE 2:

Feasibility Studies for all High-Priority Sites)

SAMPLING PLAN

ROCKY FLATS PLANT
SITE-SPECIFIC MONITORING PLAN
(Work Plan for Performance of Remedial Investigations and

February 1987

DRAFT

APPENDIX A
SAMPLING PLAN

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#### 1. INTRODUCTION

CEARP Phase 2 Confirmation consists of CEARP Phase 2a, Monitoring Plan, and CEARP Phase 2b, site characterization (remedial investigation). The Sampling Plan is one component of the Monitoring Plan for Rocky Flats Plant. The Monitoring Plan typically consists of five parts: Synopsis, Sampling Plan, Technical Data Management Plan, Health and Safety Plan, and Quality Assurance/Quality Control (QA/QC) Plan. Because of the Compliance Agreement made by the State of Colorado, Environmental Protection Agency, and Department of Energy (DOE), this Monitoring Plan also includes a Feasibility Study Plan.

CEARP uses a three-tiered approach in the preparation of monitoring plans: the CEARP Generic Monitoring Plan, the Installation Generic Monitoring Plan (IGMP), and Site Specific Monitoring Plans (SSMPs). This SSMP serves as the Work Plan for Performance of Remedial Investigations and Feasibility Studies for all High-Priority Sites required by the Compliance Agreement. Therefore, the acronym used to refer to this plan is SSMP/RIFS. This Rocky Flats Plant SSMP/RIFS Sampling Plan is the detailed work plan for implementation of CEARP Phase 2b site characterizations (remedial investigations) at Rocky Flats Plant and follows guidance provided in the IGMP/CSPCP. This SSMP/RIFS Sampling Plan is complemented by and inseparable from the Technical Data Management Plan and the Quality Assurance/Quality Control Plan. Sections of the Sampling Plan are supported by reference to the other plans and to the Synopsis. Emphasis is placed on integration of efforts for each of the CEARP Phases: Phase 3 (Technological Assessment), Phase 4 (Remedial Action), and Phase 5 (Compliance Verification and Monitoring).

Sampling at Rocky Flats Plant will be conducted using the integrated approach being implemented by CEARP. The integrated approach is summarized in the Synopsis and detailed here. The integrated approach includes characterization in stages, in which the results from the previous stage of sampling are used to design the next stage. This iterative process incorporates the experience and knowledge gained from each stage to minimize the total number of samples required to adequately characterize the site and to provide the necessary data base to prepare feasibility studies for alternative remedial actions. The benefit of staged sampling is greater flexibility within the sampling program with a minimum of cost.

#### 1.1. PURPOSE

This SSMP/RIFS Sampling Plan provides the following basic components of sample/measurement collection and analysis for each high-priority site at Rocky Flats

- objectives and goals of the investigation
- justification for selected methods and procedures
- proposed sample locations
- proposed number and type of samples
- additional site-specific information requirements.

#### 1.2. OBJECTIVES

The objectives of CEARP Phase 2b site characterizations (remedial investigations) at the high-priority sites at Rocky Flats Plant are to

- verify and characterize contaminant sources,
- determine the present areal and vertical extent of contamination,
- estimate the potential for contaminant migration (including rate and direction) to support risk assessment studies,
- support the technological assessments (feasibility studies) of alternative response actions, including the alternative of "no action," and
- support identification of long term monitoring and verification requirements, as appropriate.

#### 2. SITE SURVEY AND MAPPING

Following the guidance in the IGMP/CSPCP Sampling Plan, all monitoring locations will be described in accordance with the Installation Coordinate System (ICS) for Rocky Flats Plant. The existing coordinate system is a grid system in English units (feet). Elevations will be described in English units, feet above MSL. Surveying will be done in conformance with surveying procedures established in the IGMP/CSPCP.

#### 3. SITE-SPECIFIC MONITORING

Environmental conditions at Rocky Flats Plant have been monitored since shortly after operations began in 1952. In addition, special programs to characterize waste streams, environmental conditions, and past waste disposal practices have been conducted recently (DOE 1986b and DOE 1986f). CEARP Phase 1 identified approximately 70 sites or groupings of sites that could have adverse impacts on the environment. Additional data collected during preparation of the RCRA Part B Operating Permit Application identified several more potential sites. All potential sites at Rocky Flats Plant were designated as solid waste management units, assigned a reference number, and located on a base map (IGMP/CSPCP Sampling Plan, Plate 1).

A list of solid waste management units is presented in Appendix 1 of the RCRA Part B Operating Permit Application (3004[u] Waste Management Units) (DOE 1986f). These solid waste management units are divided into three categories. The first category includes those hazardous waste management units which will continue to operate and which require a RCRA Operating Permit. The second category includes those hazardous waste management units which are being closed under RCRA Interim Status. The third category includes those inactive waste management units (i.e., RCRA continuing release sites) that are identified under Section 3004(u) of RCRA. Another class of sites is regulated under CERCLA. These CERCLA areas identified at Rocky Flats Plant contain only radioactive wastes (DOE 1986f). However, for ease in referencing these units and/or areas, they have been collectively termed solid waste management units. A preliminary prioritization of solid waste management units based on the CEARP Phase I Installation Assessment was performed and summarized in a report titled "Preliminary Prioritization of Sites" (DOE 1986h).

The high-priority sites addressed in this SSMP/RIFS Monitoring Plan were selected and designated as high-priority sites because of their suspected relationship to preliminarily-identified contaminant plumes in groundwater. Several solid waste management units are included in most of the high-priority sites (Table 3.1 Synopsis) because of their physical proximity to each other. This results in high-priority sites that contain solid waste management units from various phases of CEARP. This is consistent with the staged approach being used by CEARP for site characterizations

(remedial investigations), where the higher priority solid waste management units within the high-priority sites are investigated first, and data from these characterizations (investigations) guide the remainder of the program.

The six high-priority sites identified at Rocky Flats Plant (Plate 1) are as follows:

- 881 Hillside Site
- 903 Pad Area Site
- Mound Area Site
- East Burial Trenches Site
- Present Landfill Site
- Solar Evaporation Ponds Site

The solar ponds and present landfill are RCRA regulated units undergoing closure. Plans for characterization of these sites have been incorporated into this SSMP and are consistent with the 40 CFR 265 Closure Plans for these facilities.

The three viable pathways for releases of contaminants from Rocky Flats Plant are air, surface water, and groundwater (DOE 1986b). Air pathway characterization studies will not be performed under CEARP, as the air pathway has been adequately characterized and documented by previous studies (DOE 1986b, RI 1986b). A site-specific discussion of the other pathways at each high-priority site is presented after each site description. A plant-wide discussion of pathways is presented in the SSMP/RIFS Synopsis.

Investigations at each high-priority site can be divided into source characterization, and migration pathway and plume characterization. Source characterization will generally consist of geophysical surveys, soil gas surveys and soil/waste sampling. Migration pathway and plume characterization will generally include geophysical surveys, soil gas surveys, soil sampling, monitor well installation, groundwater sampling, and surface water and sediment sampling. All CEARP Phase 2b site characterizations (remedial investigations) will be implemented using an integrated approach, in which geophysical and soil gas survey results are used to direct soil and groundwater sampling efforts.

Invasive sampling will be performed at many of the high-priority sites. General criteria that are considered in the sampling descriptions of this plan are as follows:

- If the solid waste management unit cannot be located through geophysical techniques, its suspected location will be sampled.
- Invasive samples from a solid waste management unit will be taken only if the presence of containers of liquid or other hazardous conditions is not anticipated.
- At least six samples will be submitted for laboratory analysis from each borehole depending on the amount of available material. The reader is referred to Section 6 of the IGMP Sampling Plan for rationale.

The following sections present high-priority site descriptions including discussions of associated solid waste management units and migration pathways, followed by detailed plans for source and migration pathway and plume characterization. Complete descriptions of the solid waste management units are contained in the RCRA Part B Operating Permit, Appendix 1 (DOE 1986f).

#### 3.6. SOLAR EVAPORATION PONDS SITE

#### 3.6.1. Site Description

#### 3.6.1.1. Solid Waste Management Unit Descriptions

The Solar Evaporation Ponds Site consists of three separate ponds (SWMU Ref. No. 101): 207C (western pond), 207A (central pond), and 207B (eastern pond). Pond 207B is separated into three sectors (north, central and south). Ponds 207A and 207C contain low-level radioactive liquid process wastes (high in nitrates) being held for evaporation, treatment and solidification. Pond 207B North receives groundwater pumped from the interceptor trench north of the solar ponds. Pond 207B Center contains treated sanitary wastewater from the treatment plant. Pond 207B south is currently empty.

The solar evaporation ponds were constructed in separate phases between 1953 and 1970. Originally, the solar evaporation ponds were a single, two-celled, clay-lined impoundment near Building 779. This pond held low-level radioactive process wastes (high in nitrates) and effluent (mostly water) from treatment of acidic liquid wastes in Building 774. The original pond was used regularly from 1953 through 1965 and was removed as part of the construction of pond 207C. The effluent from the acidic waste treatment process was thick with aluminum hydroxide and difficult to filter. Therefore, an additional pond, 207A, was constructed in 1956 to hold the effluent prior to solidification and shipment offsite. Leakage problems developed in the planking and asphalt-lined ponds, so the three 207B ponds were constructed in 1960. The 207B ponds were also lined with planking and asphalt and eventually began to leak. The liners were repeatedly patched with various materials. In 1970, all of the ponds (207A and 207B) were full, so pond 207C was constructed for additional storage and evaporative potential. Pond 207C was constructed on the site of the original clay lined pond.

In addition to the high nitrate, low-level radioactive process waste and the treated aluminum hydroxide waste, the solar evaporation ponds have received sanitary sewage sludge, lithium metal, sodium nitrate, ferric chloride, lithium chloride, sulfuric acid, ammonium persulfate, hydrochloric acid, nitric acid, hexavalent

chromium and cyanide solutions. To the greatest extent possible, oils and solvents were not sent to the ponds so that surface scum would not hamper evaporation.

A series of trenches and drains was constructed on the north facing slope below the ponds to collect leakage between 1971 and 1981. Because of various construction projects in the area, only the most recent french drain, constructed in 1981, is functional. This system more than covers the east-west dimensions of the ponds and appears to be effective in collecting the seepage.

#### 3.6.1.2. Surface Water

Surface water flows to both North and South Walnut Creeks from the solar evaporation ponds area. The northern slope of the solar evaporation ponds and the units in the 700 area drain toward the north (North Walnut Creek). Most of the runoff is contained by the perimeter road and enters the groundwater interceptor system which extends to the surface. The triangle area (SWMU ref. no. 165) drains directly to North Walnut Creek through a culvert. Runoff from the triangle area is collected in the A-series retention pond system. The southern areas of the solar evaporation ponds drain toward South Walnut Creek and runoff is collected in the B-series retention ponds.

#### 3.6.1.3. Groundwater

Groundwater occurs in both the Rocky Flats Alluvium and in bedrock materials in the vicinity of the solar evaporation ponds. The Rocky Flats Alluvium varies in thickness from about 5 to 12 ft beneath the terrace, and the ponds themselves are probably underlain by a thin veneer of Rocky Flats Alluvium. The top of bedrock forms a mild structural ridge that trends down to the east-northeast. The northern slope from the ponds toward North Walnut Creek has been extensively reworked and most of the unconsolidated materials have been removed (claystone bedrock is exposed over much of the slope). The alluvium extends to the east along the ridge, although it is fully penetrated by the perimeter road.

Bedrock immediately beneath the Rocky Flats Alluvium in the vicinity of the solar evaporation ponds consists of claystone and sandstone of the Arapahoe Formation. Twelve borings have been made in the immediate vicinity of the ponds, and

sandstone comprises roughly 20 percent or less of the bedrock materials within 150 ft of the surface. The beds dip approximately 15 degrees to the east.

Alluvial groundwater flow in the vicinity of the ponds is generally to the north. There appears to be an area of unsaturated alluvium south of the ponds (Hurr 1976 and DOE 1986f) that indicates no flow in the alluvium to the south. The alluvium is fully penetrated by the perimeter road east of the ponds. There is no spring at the outcrop; therefore, there is no alluvial groundwater flow to the east. In addition, claystone bedrock is exposed on the slope to the north of the ponds. It appears that the alluvium beneath the ponds is recharged by subsurface flow from the west, and that the discharge is to the north in the form of subsurface flow in surficial materials and overland flow over the exposed claystone bedrock. Most, if not all of this water appears to be collected in the interceptor trench system.

Flow in bedrock is less well defined. Regional studies (Hurr 1976 and Robson 1981) indicate relatively shallow gradients of about 0.03 to the east (downdip). Site-specific data are currently lacking. However, it seems likely that there is a gradient to the east plus a gradient along the strike in the near-surface, controlled by topography. In addition, there is a downward gradient between the surficial materials and bedrock of about 0.3 in areas of continuous saturation between the two materials. It appears that there is not continuous saturation between the two materials at the east-ern and southern edges of the ponds. These areas of discontinuous saturation between the materials are on the edges of alluvium saturation, where water is not always available to recharge the bedrock system.

Groundwater quality in surficial materials in the vicinity of the solar evaporation ponds is characterized by high TDS concentrations, high nitrate concentrations, high strontium concentrations, and possibly elevated radionuclides. Volatile organic compounds have been detected intermittently near the solar evaporation ponds.

#### 3.6.2. Source Characterization

#### 3.6.2.1. Geophysical Surveys

Geophysical surveys will not be performed at the Solar Evaporation Ponds Site; the pond locations are well defined.

#### 3.6.2.2. Soil Gas Surveys

Soil gas surveys will not be conducted at the Solar Evaporation Ponds Site; the pond locations are well defined.

#### 3.6.2.3. Soil/Waste Sampling

The liquids in the ponds and the sludges in Pond 207A have been adequately characterized by previous investigations (DOE 1986f). The sediments in the 207B ponds and in Pond 207C will be sampled during CEARP Phase 2 investigations. Soil sampling around the solar evaporation ponds will be conducted to evaluate the extent of soil contamination and is discussed in Section 3.6.3.2.

#### 3.6.3. Migration Pathway and Plume Characterization

#### 3.6.3.1. Soil Gas Surveys

Soil gas surveys will not be performed at the Solar Evaporation Ponds Site. Detailed soil and groundwater sampling at the site adequately defines groundwater plumes.

#### 3.6.3.2. Soil Sampling

Soils on the berms of the solar evaporation ponds and on the hillside north of the ponds will be sampled to evaluate the extent of soil contamination. Approximately 20 borings are anticipated (Plate 3). Three borings will be located on the eastern berm of pond 207B, two borings will be drilled into the berm between ponds 207A and 207B, and two borings will be located on the berm between ponds 207A and 207C. Another six boreholes will be drilled on the hillside north of the solar evaporation ponds. Borings will extend to the water table or to the top of bedrock if top of bedrock is above the water table.

Soil sampling will be implemented in phases. After analyzing results from soil sampling on the pond berms and the north hillside, another 7 to 10 soil borings may

be drilled downgradient of the ponds outside the perimeter security zone. These borings may extend down the hillside to North Walnut Creek to delineate areas of contaminated soil. Soil sampling and analysis details will be provided in the revised Solar Evaporation Ponds Closure Plan.

#### 3.6.3.3. Monitor Well Installation and Groundwater Sampling

Twenty-two new monitor wells were drilled around the solar evaporation ponds as part of the initial CEARP Phase 2b site characterization (remedial investigation). This monitoring system rings the solar evaporation ponds with alluvial and bedrock wells. In addition, there are several alluvial and bedrock monitor wells downgradient of the ponds in both North and South Walnut Creeks.

Because of the extensive groundwater monitoring system already in place at the solar evaporation ponds, only two new monitor wells are proposed downgradient of the ponds (Plate 4). One well will be installed in North Walnut Creek immediately north of existing well 13-86 to characterize groundwater flow in the North Walnut Creek valley fill alluvium. Another well will be located on the hillside north of the ponds.

#### 3.6.3.4. Surface Water and Sediment Sampling

Surface water samples will be collected from established sampling locations up and downstream from the Solar Evaporation Ponds Site. Included will be stations along North Walnut Creek and South Walnut Creek. Surface water samples will also be collected from any springs or seeps occurring on the hillsides north of the solar evaporation ponds. Samples will be analyzed for the parameters in Tables 3.1 and 3.2 as appropriate.

#### Table 3.1. Source Sampling Parameters

Metals<sup>a,b</sup>
Hazardous Substance List - Metals
Beryllium
Chromium (hexavalent)
Lithium
Strontium

Organics Hazardous Substances List - Volatiles<sup>b</sup> Oil and Grease<sup>2</sup>

Radionuclides<sup>b</sup>
Gross Alpha
Gross Beta
Uranium 233, 234, and 238
Americium 241
Plutonium 239
Strontium 90
Cesium 137
Tritium

Other
TCLP
EP Toxicity
Characteristics (e.g., ignitability, corrosivity, reactivity)
pH
Cation Exchange Capacity

<sup>&</sup>lt;sup>2</sup>These analyses will be performed on only one-third of the samples. <sup>b</sup>These analyses may be performed on sediments.

#### Table 3.2. Groundwater and Surface Water Sampling Parameters

Field Parameters pH Specific Conductance Temperature Dissolved Oxygen\*

Indicators
Total Dissolved Solids
Total Suspended Solids\*

Metals\*\*
Hazardous Substances List - Metals\*\*\*
Beryllium\*\*\*
Calcium
Chromium (hexavalent)\*\*\*
Iron
Lithium\*\*\*
Magnesium
Manganese
Potassium
Sodium
Strontium\*\*\*
Zinc

Amions
Carbonate
Bicarbonate
Chloride
Sulfate
Nitrate

Organics
Hazardous Substances List - Volatiles
Oil and Grease\*\*

Radionuclides
Gross Alpha
Gross Beta
Uranium 233, 234, and 238
Americium 241
Plutonium 239
Strontium 90
Cesium 137
Tritium

#### Table 3.2. (Continued)

Other
EP Toxicity
Characteristics (e.g., ignitability, corrosivity, reactivity)

<sup>•</sup> for surface water samples only

<sup>\*\*</sup> dissolved metals for groundwater samples, total and dissolved metals for surface water samples

<sup>\*\*\*</sup>These analyses will be performed on only one-third of the samples.

### 4. SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Protocols for sample containers, sample preservation, and holding times will conform to those specified in the CGMP and IGMP/CSPCP Sampling Plans and Quality Assurance/Quality Control Plans.

### 5. SAMPLE CONTROL AND DOCUMENTATION

Procedures for sample control and documentation will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

## 6. SAMPLE HANDLING, TRANSPORT, AND STORAGE

Procedures for sample handling, transport, and storage will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

#### 7. SAMPLE PREPARATION AND ANALYSES

Procedures for sample preparation and analyses will conform to those specified in the CGMP and IGMP/CSPCP Quality Assurance/Quality Control Plans.

#### 2. REFERENCES

- DOE 1986b: "Comprehensive Environmental Assessment and Response Program Phase 1: Draft Installation Assessment Rocky Flats Plant," US Department of Energy unnumbered draft report, April 1986.
- DOE 1986f: "Resource Conservation and Recovery Act Part B Operating Permit Application for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," US Department of Energy unnumbered report, November 1986.
- DOE 1986g: "Resource Conservation and Recovery Act Part B Post-Closure Care Permit Application for USDOE Rocky Flats Plant, Hazardous and Radioactive Mixed Wastes," US Department of Energy unnumbered report, November 1986.
- DOE 1986h: "Draft Preliminary Prioritization of Sites," US Department of Energy unnumbered draft report, July 1986.
- Hurr 1976: R.T. Hurr, "Hydrology of a Nuclear-Processing Plant Site, Rocky Flats, Jefferson County, Colorado," US Geological Survey Open-File report 76-268, 1976.
- RI 1986a: "Annual Environmental Monitoring Report: January-December 1985," Rockwell International Rocky Flats Plant, Golden, Colorado report RFP-ENV-85, April 1986.
- RI 1986b: "Rocky Flats Plant Radioecology and Airborne Pathway Summary Report," Rockwell International, Rocky Flats Plant, Golden, Colorado unnumbered report, December 1986.
- Robson 1981: Robson, S.G., J.C. Romero and S. Jawistowski, "Geologic Structure, Hydrology, and Water Quality of the Arapahoe Aquifer in the Denver Basin, Colorado," US Geologic Survey Hydrologic Atlas HA-647, 1981.

# APPENDIX B HYDROGEOLOGIC DATA

# EXPLANATION OF SYMBOLS AND TERMS ON BORING LOGS

### SAMPLE TYPE

Split Spoon

NC Core

Continuous Drive

Bulk

GRAPHIC LOG

Clay or Claystone

Clayey Sand or Sandy Clay

Silty Claystone

Cobbles, Gravel and/or Boulders

Sand and Sandstone

Sand and Gravel

Silt or Siltstone

Artificial Fill / Disturbed Ground

# APPENDIX B-1 1986 MONITOR WELLS

#### INDEX OF DATA

Boring No.: 4-86						
Completed as well? Yes						
Data in File						
X Log of Borehole						
X Well Construction Summaries						
X Well Development Summaries						
Hydraulic Conductivity Test Data and Results						
Packer Test Data and Results						
X Water Level Data						
Saturated Thickness Hydrographs						

Project: Rocky Flats Plant LOG OF BORING NO. 4-86										
	Drille	-	4/24/86		Coordinate		54/.5			
Bori	ng Met	hod	HOLLOW	Stem Auger	Ground Sui	rface Elevation				
Elev. (feet)	Depth (feet)	Semple Type	Graphic Lóg	Material Descri	ption	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests		
	0 _			VALLEY FILL ALI	MUIVUM	1 1 1 1				
	1			0-0.7'. CLAY: of brown; silty; tragranitic pebbles:	ace					
				0.7-1.5'. CLAY: to dark brown; so fine-grained sand	ome very		-			
	_			1.5-2.7'. SAND: to dark brown; pe	medium		-			
	- 3-			sorted; fine to quartz and felds; clay partings; me	coarse; par; silty		-			
	-			2.7-3.0'. CLAY: grayish brown; i	dark ron stains		-			
	-			<pre>and trace granit pebbles; silty; wet.</pre>						
	1			3.0-8.0'-Sample. Recovered 1.7/5.						
	-			3.0-4.0'. CLAY: above; moist to			_			
	6 -			6.3-8.0'. CLAY: grayish brown; s stains and trace	ilty; iron		-			
	-			pebbles; moist t 8.0-10.5'-Sample	ı <b>.</b>		-			
	1			Recovered 0.7/2. 8.0-8.7'. CLAY:	dark					
	-			<pre>brown; silty; tr grading to some cobbles; moist.</pre>			; <del></del> -			
	1			10.5-13.0'-Sampl Recovered 1.3/2.			_			
	— 9 — —			11.7-12.2'. CLA to dark brown; s granitic pebbles	one		-	·		
	-			cobbles; sandy t gravelly; moist.	:0					
				Wet at 12.0'. 12.2-13.0'. CLA			, <del>,</del>			
	1			brown to medium sandy to gravell granitic pebbles	y; some and		-			
	12			cobbles; iron st	aining;		V			
Rema	rks		Logged	by: S. Paschke			Checked by:			
Proje	Project No. 106P06222  Hydro-Search, Inc. Page 1 of 2									

Project: Rocky Flats Plant LOG OF BORING NO. 4-86									
	Date Drilled 4/21/86 Coordinates  Boring Method Hollow Stem Auger Ground Surface Elevation 5645								
Elev. Depth Sample (feet) (feet) Type		Grantin		ption	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests		
	12			13.0-15.5'-Sample Recovered 2.1/2.1  13.0-14.7'. CLA' gray; some fine sand and some grayebbles; iron stawet.  14.7-14.9'. CLA' gray; some fine sand and graniti iron staining; was ARAPAHOE FORM  15.5-18.0'-Sample Recovered 2.5/2. CLAYSTONE: medislightly sandy;  TOTAL DEPTH:	f:=84%.  Y: medium to coarse anitic aining;  Y: medium to coarse c pebbles; et.  MATION e. 5'=100%. um gray; moist.	20 40	20 40		
	21-								
	24								
Rema			Logged	by: S. Paschke			Checked by:		
Proje	ct No. 106P06	222		Hydro-S	earch,	Inc.	Page 2 of 2		

WEL	4-86		

						WELL CONSTR	RUCTION S	UMM	ARY		
						LOCATION or COORDS:	ELEVATION: GROUP	ND LEVEL		36.60'	
	-					N 40437.1 E 30774.2	TOP O	F CASIN	s <u>56</u>	37 <u>.94</u> '	
ı	1	.2			<b>//</b>	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:	<del></del>	
					-	TOTAL DEPTH Well: 14.92' Hole: 18.00'			ART	FIN	NISH
						BOREHOLE DIAMETER 74"	TASK DRILLING:	DATE 1986	TIME	<u>DATE</u> 1986	TIME
	$\ \cdot\ $	4				DRILLER Boyles Brothers Drilling Co.	7½" auger	4/24	1440_	4/24	1600
					E	Golden, CO (Doyle Styles)					
						RIGMobile B-57	GEOPHYS. LOGGING:			<u> </u>	
8 3					Ē	BIT(S) Blade bit	CASING:		. 70.5		1700
Colden, CO	- t as-	6				DRILLING FLUID None	2" stainless	4/24	1725	4/24	1730
3 0	1				=	SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT	4/24	1730	4/24	1810
_					=		CEMENTING:	4/25	1010	4/25	1020
NO.	<u> </u>	8			(E	WELL DESIGN:	CEVELOPMENT:	8/29	1606	8/29	1606
LOCATION _	5				<u>,                                    </u>	BASIS: GEOLOGIC LOG GEOPHYSICAL LOG	OTHER:				-
007						CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	4/25	1000	4/25	1010
					E	0.00' 3.52' C1				<del></del>	
						3.52' - 14.92' S1	<del></del>				<b> </b>
		10			=		<del></del>				
							WELL DEVELOR	MENT			
					E		<u>See Well Develo</u>	opment S	ummary	Sheet.	· · · · ·
	1	12			=					· · ·	
					E	CASING: CI 2" I.D. Sch. 5 type 316 stain-					
Plant					=	less steel, threaded and flush					
<u>a</u>					E	jointed.					
2 ats						SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>
3622 FF		14	░			less steel, threaded and flush					
106P06222 Rocky Flats					=	jointed, 0.020" wire wrap screen,	COMMENTS:				
7 ~			-	_		0.25' welded bottom cap.	<u>Water</u> encounte	red at	12.00'	during o	<u>irillin</u>
					=	CENTRALIZERS Centralizer placed approxi-				1 6	
		16				mately mid-point on screened interval.	Top of stainle	ss stee	casin	g: 1.3	14.
ECT						FILTER MATERIAL 12-20 silica sand	<del></del>				<del></del>
PROJECT						2.40' - 18.00'					
ā	'					CEMENT Portland Type I					
	F	<sub>18</sub>				0.00' - 1.95'					
						OTHER <u>3/8" bentonite pellets</u> 1.95' - 2.40'					
											<del></del>
	-	20				LIVORO CEAROLL					
	ــــــــــــــــــــــــــــــــــــــ				ئىنى	HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGISTS

# WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
8-29-86	1606	_	-	-	Dry-moist dark brown mud in bottom of hole
<del></del>					
<del> </del>					
				·	

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
0486	08/29/86	5636.60	5637.94	1.34	14.92	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/23/87					7.21	5630.73
	04/01/87					5.54	5632.40
	05/07/87					5.54	5632.40
	06/02/87					6.60	5631.34
	07/08/87					7.45	5630.49
	08/04/87					-1.00	DRY
	08/10/87					-1.00	DRY
	09/01/87					-1.00	DRY
	10/01/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/08/87					-1.00	DRY
	01/07/88					7.20	5630.74
	02/24/88					6.30	5631.64
	03/07/88					6.50	5631.44
	04/11/88					6.80	5631.14

### INDEX OF DATA

Boring No.: 11-86
Completed as well? Yes
Completed as well.
Data in File
X Log of Borehole
X Well Construction Summaries
X Well Development Summaries
Hydraulic Conductivity Test Data and Results
Packer Test Data and Results
X Water Level Data
Saturated Thickness Hydrographs

Project:

Rocky Flats Plant

# LOG OF BORING NO. 11-86

Date Drilled 9/5/86

**Boring Method** 

Coordinates
Ground Surface Elevation 5723

Bori	oring Method Hollow Stem Auger Ground Surface Elevation 5723						
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content 20 40	Other Tests
	0	//		VALLEY FILL ALLUVIUM			
				0.0-2.0'-Sample.			
	_			Recovered 2.0/2.0'=100%.			
	-		0000	0.0-0.7'. SAND AND GRAVEL: Grayish brown (5YR			
			000	3/2); some granitic			
	-		000	pebbles; roots and grasses		-	
		///	9000	common; poorly sorted; angular; unconsolidated;		_	
	_	///	O:()a	dry.	1	_	
			0000	0.7-2.0'-Sample. GRAVEL:		_	
			0.0	grayish brown (5YR 3/2)		-	
			0.0	fine- to medium-grained			
	2.5		Doc o	<pre>sand and gravel; few roots; poorly sorted;</pre>			
	-		000	subangular;			
			000	unconsolidated; dry.			
	-		000	2.0-3.0'-Sample.		-	
	_		, 00°			-	
	_	///	000	GRAVEL: dark yellowish brown (10YR 4/2) with very		_	
			000	coarse grained granitic		_	
				pebbles; some red (5R 4/6)			İ
			01 /0.	<pre>iron staining; poorly sorted; angular to</pre>			
			108D	subrounded;			
			000	unconsolidated; dry.		-	
	<b>-</b> 5 -	//	200	3.0-6.0'-Sample.		, –	
	-	///		Recovered 0.0/3.0'=0%.	1	1	
	_	///	$\supset \cdot \sim \cdot \cdot$	/6.0-8.0'-Sample.		-	
	-			/ Recovered 0.8/2.0'=40%		-	
		//	20.0	SAND: grayish red (5R 4/2) coarse to fine-		-	
				grained with several			
		//.		<pre>quartzite and granite pebbles; poorly sorted;</pre>			
				angular; unconsolidated;		•	
				dry.			
				8.0-10.0'-Sample. Recovered 1.5/2.0'=75%.			
	-			r <del></del>	<b>1</b> i	7	
	<b>−7.5 −</b>			8.5-9.5'. SAND AND		-	
	-	///		GRAVEL: dark yellowish brown (10YR 4/2) with gray		$\overline{}$	
	_	///		quartzite pebbles; poorly		<u> </u>	
	_			sorted; angular; unconsolidated; dry.	i .	-	
						_	
		//)		ARAPAHOE FORMATION		_	
				9.5-10.0'. CLAYSTONE:	1 1		
			• • • • • • • • • • • • • • • • • • • •	pale yellowish brown (10YR	1		
				6/2); slightly sandy; moderate yellowish brown	]		
				(10YR 5/4) mottles; no			
	10	[ / J		<pre>pebbles; blocky texture; dry.</pre>	[,,,,	.,,,,,,	
		7			<del> </del>		
Rema	Irks	Log	ged by:	J. Bergman	Checke	d by:	
Proje	ect No.						

106P06222

Hydro-Search, Inc.

Page 1 of 2

LOG OF BORING NO. 11-86 Project: Rocky Flats Plant Coordinates Date Drilled 9/5/86 **Ground Surface Elevation** 5723 Boring Method Hollow Stem Auger Penetration Resistance င္ကလိုန္ပြန္မ်ား Other Depth Sample Graphic (feet) Type Log Tests **Material Description** (Blows/Inch) 20 20 40 40 10.0-11.5'-Sample. Recovered 2.0/1.5'=125%. 10.0-10.5'. CLAYSTONE: dark yellowish brown (10YR 4/2); dry. 10.5-11.0'. CLAYSTONE: light olive gray (5Y 5/2) and dark yellowish brown (10YR 4/2) clay with moderate yellowish brown (10YR 5/4) mottles; consolidated; dry. 11.0-11.5'. SANDSTONE: very light gray (N 8/0) with moderate brown (5YR 4/4) fine-grained to medium-grained sand; well sorted; rounded; consolidated; dry. 11.5-12.0'-Sample. Recovered 1.5/1.5'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4); dry. 12.0-13.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: moderate brown (5YR 4/4) and light olive gray (5Y 5/2) very finegrained to fine-grained sand; homogeneous; well sorted; rounded; well cemented; dry.
13.0-14.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium light gray (N 6/0) fine-grained sand; few black organic particles; well sorted; silica cement; Last 1.0" contains pale yellowish brown (10YR 6/2) and light brown (5YR 6/4) finegrained to very finegrained sand; rounded; no clay; dry. 14.0-15.0'-Sample. Recovered 1.0/1.0'=100%. SANDSTONE: medium gray and medium light gray (N6/5) very fine-grained to fine-grained sand; some patches of pale yellowish brown (10YR 6/2) sand; well sorted; rounded; well

Remarks

Logged by: J. Bergman

TOTAL DEPTH:

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

15.0'

Page 2 of 2

WELL	11-86	

		_ 0			WELL CONSTR					
					N 40321.2 E 26931.0	ELEVATION: GROUP	D LEVEL		12.19' <b>14.75'</b>	
		_ 2		0,000	DRILLING SUMMARY:  TOTAL DEPTH Well: 10.25' Hole: 15.00'	CONSTRUCTION TIME LOG:   START   FINISH				
				0. O	BOREHOLE DIAMETER 72"	TASK DRILLING:	<b>DATE</b> 1986	TIME	<b>DATE</b> 1986	TIME
		- 4		0	DRILLER Boyles Brothers Drilling Co. 15865 W. 5th Avenue	7년 auger	9/5	1315	9/5	1600
LOCATION Golden, CO PERSONNEL J. Bergman					Colden, CO (Tony Robinson)  RIG Acker  Bull nose bit	GEOPHYS. LOGGING:				
	gman	<b>-</b> 6		PC	DRILLING FLUID None	CASING: 2" stainless	9/6	1020	9/6	1025
	J. Ber			N	SURFACE CASING 5" x 4' steel w/ locking cap	FILTER PLACEMENT	9/6 9/6	1025 1045	9/6 9/6	1030
	SONNEL	<del>-</del> 8		4	WELL DESIGN:  BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	CEMENTING: LEVELCPMENT: OTHER:	9/8	1500	9/18	1000
	PER				CASING STRING(S): C=CASING S=SCREEN    0.0'   3.94'   C1	Bentonite	9/6 9/6	1030	9/6 9/6	1035
	-	<del>-</del> 10								
		<b>–</b> 12			CASING: CI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush	See Well Devel		Summary	Sheets.	
106P06222 Rocky Flats Plant	<u>F   1</u>	- 14			screen: si 2" I.D. Sch. 5 type 316 stain— less steel, threaded and flush				-	DOMONIA DO COMO DE COM
	Kocky F1				jointed. 0.010" wire wrap screen  0.25' welded bottom cap.  CENTRALIZERS Type 304 stainless steel	No water ancou				
PROJECT		6.32' - 7.51'  FILTER MATERIAL 32.42 silica sand				Top of stainless steel casing: 2.56'  Cave from TD to 13.75'				
		<b>–</b> 18			3.00' - 10.50'  CEMENT Portland Type I  0.00' - 2.00'	Cave Iron ID	20 13.7			
					OTHER 3/8" bentonite pellets  2.00' - 3.00'  10.50' - 13.75'					
		<b>-</b> 20			HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGISTS

### **WELL DEVELOPMENT SUMMARY SHEET**

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
09-08-86	1500				l Well Bore Volume = 0.39 gal. 10 Well Bore Volumes = 3.9 gals.
					Sand in bottom of well
09-08-86	1500	Bailed	0.5 gal.	Medium brown	0.5/3.9 gals. purged to date
09 <b>-</b> 08-86	1600	Bailed	1.5 gals.	Initially clear, then medium brown	500 ml sand 2.0/3.9 gals. purged to date
09-10-86	0935	Airlifted	1.5 gals.	Clear	Went dry after first airlift
09-11-86	1055	Bailed	0.75 gals.	Medium brown, moderately turbid	Large amount of filter sand in bottom of bailer. 2.75/3.9 gals. purged to date.
09-13-86	1340	Bailed	1.2 gals.	Brown to light brown, moderately turbid	Large amount of sand on bottom 3.9/3.9 gals. purged to date
09-16-86	1510	Bailed	1.1 gals.	Clear to light brown	Still large amounts of sand in well. 5/3.9 gals. purged to date
09-17-86	0915	Bailed	1.0 gals.	Clear to light	Still large amounts of sand in bottom. 6/3.9 gals. purged to date
09-17-86	1830	Airlifted			Very fine mist. Blew the sand out.
09-18-86	1000	Bailed		Clear to light brown	Sampled for VOA, Field Water Quality, and HSL metals
			-		
					•
				·	

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1186	09/08/86	5712.19	5714.75	2.56	10.25	10.43	5704.32
	09/09/86					9.85	5704.90
	09/10/86					10.18	5704.57
	09/11/86					9.77	5704.98
	09/13/86					9.75	5705.00
	09/17/86					10.54	5704.21
	09/18/86					10.85	5703.90
	09/24/86					6.17	5708.58
	10/13/86					10.60	5704.15
	11/26/86					9.43	5705.32
	01/01/87					9.46	5705.29
	03/02/87					8.02	5706.73
	04/01/87					5.60	5709.15
	05/07/87					4.88	5709.87
	06/01/87					8.27	5706.48
	07/08/87					8.50	5706.25
	07/30/87					9.40	5705.35
	08/04/87					9.70	5705.05
	09/28/87					10.00	5704.75
	11/03/87					10.00	5704.75
	12/08/87					10.00	5704.75
	01/06/88					9.80	5704.95
	02/24/88					7.70	5707.05
	03/14/88					7.90	5706.85
	04/11/88					7.70	5707.05

#### INDEX OF DATA

Boring No.: 12-86
Completed as well? Yes
Data in File
X Log of Borehole
X Well Construction Summaries
X Well Development Summaries
X Hydraulic Conductivity Test Data and Results
Packer Test Data and Results
X Water Level Data
Saturated Thickness Hydrographs

Rocky Flats Plant

## LOG OF BORING NO. 12-86

Date Drilled 9/6/86

Coordinates

Bori	ng Met	hod	Holl	ow Stem Auger Ground Su	rface Elevation	on 5788	
Elev. (feet)	Depth (feet)	Sample Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Conjent 20 40	Other Tests
	7.5			VALLEY FILL ALLUVIUM  0.0-2.0'-Sample. Recovered 1.2/2.0'=60%. SAND: dark yellowish brown (10YR 4/2) very fine-grained sand and clay; trace gray quartzite pebbles; poorly sorted; angular; unconsolidated; moist.  2.0-4.0'-Sample. Recovered 2.0/2.0'=100%. CLAY: dark yellowish brown (10YR 5/4) and moderate yellowish brown (10YR 4/2) with some quartzite and granite pebbles and cobbles; poorly sorted; angular; unconsolidated; damp.  4.0-6.0'-Sample. Recovered 2.0/2.0'=100%. SAND: moderate yellowish brown (10YR 5/4) fine- grained sand and gray quartzite pebbles; poorly sorted; angular to subrounded; unconsolidated; damp.  6.0-8.0'-Sample. Recovered 0.6/2.0'=30%. CLAY: moderate yellowish brown (10YR 5/4) clay and sandy clay with several granitic pebbles and cobbles; poorly sorted; angular; unconsolidated; damp.			
	1 1 1			8.0-10.0'-Sample. Recovered 2.0/2.0'=100%. SAND: pale yellowish brown (10YR 6/2) very fine-grained sand and clay; some granitic pebbles; poorly sorted; angular; unconsolidated; damp.		<b>▼</b>	
Rema	ırk <b>s</b>	إما	gged by:	: J. Bergman	Checke	d by:	
Proje	ect No.	06222		Hydro-Search,	Inc.	Page 1 of 2	

Project: LOG OF BORING NO. 12-86 Rocky Flats Plant Date Drilled 9/6/86 Coordinates **Boring Method Ground Surface Elevation** 5788 Hollow Stem Auger Penetration Resistance Other Depth Samb Graphic (feet) Type Log Elev. Tests **Material Description** (Blows/Inch) 20 40 20 40 10.0-11.0'-Sample. Recovered 1.0/1.0'=100%. CLAY: pale yellowish brown (10YR 6/2) clay with trace granitic pebbles poorly sorted; angular to rounded; unconsolidated; ARAPAHOE FORMATION 11.0-12.0'-Sample. Recovered 1.0/1.0'=100%. CLAYSTONE: pale yellowish brown (10YR 6/2) and light brown (5YR 5/6); consolidated; weathered; dry. 12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2) with some moderate brown (5YR 4/4) mottles; consolidated; dry. 14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2) and moderate yellowish brown; consolidated; dry. TOTAL DEPTH: Remarks Checked by: Logged by: J. Bergman Project No. Hydro-Search, Inc. 106P06222 Page 2 of 2

WELL	12-86	
**		_

		<b>-</b> 0		WELL CONSTR	UCTION S	UMM	IARY		
				. LOCATION or COORDS:	ELEVATION: GROUP	ND LEVE		77.88' 80.56'	
		_ 2		DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
				TOTAL DEPTH Well: 11.30' Hole: 16.00' BOREHOLE DIAMETER 74"	TASK	<u>DATE</u> 1986	IIME	DATE	TIME
		- 4		DRILLER Boyles Brothers Drilling Co.	DRILLING:	9/6	1315	9/6	1500
					GEOPHYS. LOGGING:				
00	Bergman	6		BIT(S) Bull nose bit	CASING: 2" stainless	9/6	1655	9/6	1600
Golden,	J. Ber		N	DRILLING FLUID None					
	IEL			SURFACE CASING 5" x 4' steel w/ locking cap  WELL DESIGN:	FILTER PLACEMENT	9/6 9/6 9/8	1700 1735 1345	9/6 9/6 9/9	1730 1740 1505
OCATION	PERSONNEL	- 8		BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG CASING STRING(S): C=CASING S=SCREEN	OTHER: Bentonite	9/6	1730	9/6	1735
	ā.			0.0' 2.04' C1		9/6	1650	9/5	1655
ĺ	ı	-10							
					WELL DEVELOR	PMENT			
		-12		CASING: C1 2" I.D. Sch. 5 type 316 stain-	See Well Develo	opment	Summary	Sheets.	
				less steel threaded and flush jointed.					
	s Plant	- 14		SCREEN: SI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush					
106P06222	Flat			jointed, 0.010" wire wrap screen, 0.25' welded bottom cap.	Water encounts	ered at	9.0' di	ıring dr	illing.
ļ	Rocky	<del></del> 16		CENTRALIZERS Type 204 stainless steel 6.18' - 7.36'	Top of stainle	ss stee	l casing	g: 2.68	3'
PROJECT				FILTER MATERIAL 32-42 silica sand 2.40' - 11.50'	Cave from TD to	o 15.10	1		
O.	'	<b>–</b> 18		CEMENT Portland Type I 0.00' - 2.00'					
				OTHER 3/8" bentonite pellets _2.00' - 2.40' _11.30' - 11.50'		· · · · · · · · · · · · · · · · · · ·			
		- <sub>20</sub>							
	ı		 	 HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	<b>JGISTS</b>

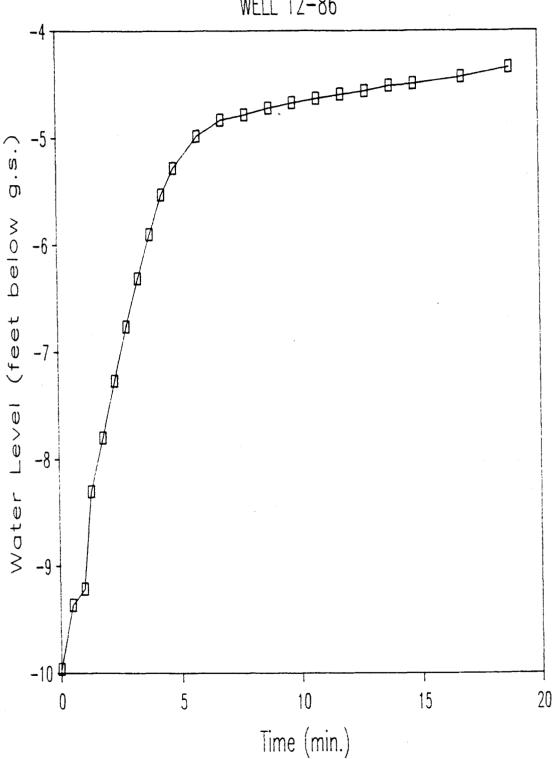
Well No.: 12-86

### **WELL DEVELOPMENT SUMMARY SHEET**

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
09-08-86	1345			•	1 Well Bore Volume = .13 gal. 10 Well Bore Volumes = 1.3 gals.
09-08-86	1345	Airlifted		Light to medium brown	Airlifted for 1 hour. Well recovered 3' in 10 minutes
09-09-86	1505	Bailed	14 gals.	Clear to slightly turbid	Ready for sampling
09-11-86	0900	Bailed		Clear to slightly turbid	Sampled
<u></u>					
	-				

## AQUIFER TEST DATA.

WELL 12-86



AQUIFER TEST DATA

WELL 12-86

Type of Aquifer Test: Bail down - Recovery How @ Measured: 4.5 gallon bucket

How W.L.'s Measured: Olympic Well Sounder

Measuring Point for W.L.'s: Top of Casing Elevation of Measuring Point: 5790.49

Depth of pump/airline:

Start bailing: "

1115.00 Time:

Project No.: 106P06222 Location: Rocky Flats Plant

Personnel: J. Pearce, M. Bergman

Stop bailing:

Time: 1145.10

Duration of Aquifer Test:

49 minutes

TIME t = 30.15 min	at t' = 0	Static W	LEVEL DATA later Level: 4.08'	
ŧ	ţ'	Water Level	Draw-	
9				Begin bailing
30.2	¢	9.96	5.38	Stop bailing
30.7	.5	9.36	5.28	;
31.2	1.0	9.21	5.13	
31.5	1.3	8.30	4.22	
32.0	1.8	7.80	3.72	
32.5	2.3	7,27	3.19	
33.0	. 2.8	5.75	2.48	
3 <b>3.5</b>	3.3	6.31	2.23	
34.0	3.8	5.90	1.32	
34.5	4.3	5.53	1.45	
J5.0	4.3	5.28	1.20	
5 <b>6.</b> 0	5.8	4.98	.90	
37.0	6.8	4.83	.75	
38.0	7.8	4.78	.70	
39.0	9.8	4.72	. 54	
40.0	9.8	4.67	.59	90% Recovered at
41.0	10.3	4.63	.55	4.67'
42.0	11.8	4,59	.51	
43.0	12.8	4.56	.48	
44.0	13.8	4.51	. 43	
45.0	14.9	4,49	.41	
47.0	16.8	4.43	. 35	
49.0	18.8	4.34	.26	

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1286	09/08/86	5777.88	5780.56	2.68	11.30	6.00	5774.56
	09/09/86					5.75	5774.81
	09/25/86					6.17	5774.39
	09/26/86					6.60	5773.96
	10/13/86					4.36	5776.20
	11/26/86					5.60	5774.96
	01/01/87					3.42	5777.14
	02/01/87					2.68	5777.88
	04/01/87					3.35	5777.21
	05/06/87					2.68	5777.88
	06/01/87					2.55	5778.01
	07/08/87					5.00	5775.56
	08/04/87					5.30	5775.26
	09/28/87					4.80	5775.76
	11/03/87					3.90	5776.66
	02/04/88					-1.00	DRY
	03/14/88					-1.00	DRY
	04/11/88					2.70	5777.86

#### INDEX OF DATA

Boring No.: 13-86
Completed as well? Yes
Data in File
X Log of Borehole
X Well Construction Summaries
Well Development Summaries
Hydraulic Conductivity Test Data and Results
Packer Test Data and Results
_X Water Level Data
X Saturated Thickness Hydrographs

Rocky Flats Plant

## LOG OF BORING NO. 13-86

Coordinates N 38867.0 E 22951.0

Date Drilled 8/20/86

Boring Method.

Project No.

106P06222

Hollow Stem Auger

Ground Surface Elevation 5837.22

° -	0.000	VALLEY FILL ALLUVIUM		
		O.0-2.5'-Sample. Recovered O.0/2.5'=0\$. COBBLES: micaceous granite cobbles and pebbles; poorly sorted; unconsolidated; dry.  2.5-5.0'-Sample. Recovered O.0/2.5'=0\$. CLAY: dark yellowish brown (10YR 4/2); trace of sand and gravel; poorly sorted; unconsolidated; damp.  5.0-8.0'-Sample. Recovered 2.0/3.0=67\$. CLAY: dark yellowish brown (10YR 4/2) and dusky brown (5YR 2/2) silty, sandy clay; gray quartzite cobbles from 6.7-7.0'; rounded; damp.  8.0-9.0'-Sample. Recovered 0.5/1.0'50\$. GRAVEL: moderate yellowish brown (10YR 5/4) and medium light gray (N6) sandy gravel; some silty clay; poorly sorted; unconsolidated; damp.  ARAPAHOE FORMATION  9.0-13.0'-Sample. Recovered 3.5/4.0'=75\$.  9.0-10.1'. CLAYSTONE: light olive gray (5Y 6/1); consolidated; dry.  10.1-10.7'. CLAYSTONE: light olive gray (5Y 6/1); consolidated; dry.  10.7-13.0'. CLAYSTONE: light gray (N 7) silty claystone; consolidated; dry.  13.0-15.5'-Sample. Recovered 2.5/2.5'=100\$. CLAYSTONE: moderate yellowish brown (10YR 5/4)		
		silty claystone with traces of limonite concre- tions; blocky texture; consolidated; dry.		1
20	<u> </u>	TOTAL DEPTH: 15.5'	ced by:	<u> </u>

Hydro-Search, Inc.

Page 1 of 1

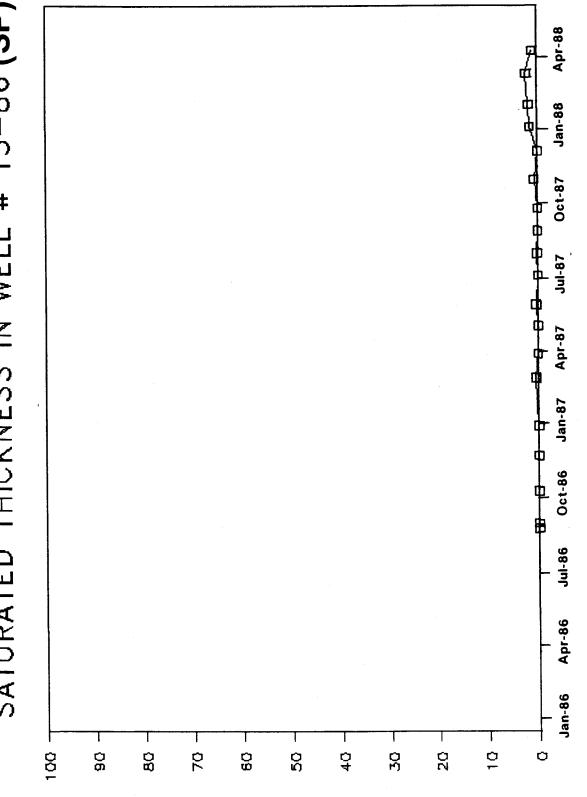
WELL 13-86
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		Lo				0	WELL CONCTE	DICTION SI	IRARA	<b>^</b> DV		
						<u>}</u>	WELL CONSTR	RUCTION SI				
					鄒	$\le$	LOCATION or COORDS:			- 50	<u>37.22'</u> 39.94'	
					緣	•	N 38867.0 E 22951.0	TOP OF	CASING	3	37.74	
		_ 2			4	9	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
						<u>:</u> 4	TOTAL DEPTH Well: 9.50' Hole: 15.50'		ST	ART	FIN	ISH
				_	E	킄	BOREHOLE DIAMETER	TASK	DATE	TIME	DATE	TIME
					E	3		DRILLING:	1986		1986	4
		L 4		≣		3	DRILLER Boyles Brothers Drilling Co.	7½" auger	8/20	1230	8/20	1340
							15865 W. 5th Avenue					
				≣		昌	Golden, CO (Jim Horn)  Mobile B-57					
						긐	RIGMobile B-5/ BIT(S)Bull nose bit	GEOPHYS. LOGGING: CASING:				
8	ka i	6	1			3	D11(3)	2" stainless	8/20	1607	8/20	1609
· ua	Pivonka	Ĭ		≣		3	ORILLING FLUID None					
Colden	L. P				1		511 51 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0.700	1600	0./20	1622
				≣		彐	SURFACE CASING 5" x 5' steel w/ locking	FILTER PLACEMENT	8/20 8/20	1609 1630	8/20 8/20	1623 1641
Z	MEL	_ 8			=	킄	WELL DESIGN:	CEMENTING: LEVELOPMENT:	9/3	1035	9/3	1035
OCATION	PERSONNEL			≣	Ę	Į.	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
000	ER			≣		3	CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	8/20	1623	8/20	1625
_	ů.			Ξ		3	0.00' 3.09' C1	<del></del>	8/20	1605	8/20	1607
					Ē	3	3.09'- 9.50' S1					<del></del>
		-10			ŧ	킄						
Ī						킄		25.45.05			<del>  </del>	
					Æ	딐		WELL DEVELOR	MENI			
					ŧ	当		G 17 11 D 1			C	
		-12			E	킄	CASING: C1 2" I.D. Sch. 5 type 316 stain-	See Well Develo	opment	ounnary	Sneets.	
					E	킄	less steel threaded and flush				<del> </del>	<del></del>
				۰	ŧ	긐	jointed.					
	Plant				E	3						<del></del> .
	rol	_14			E	킄	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
22	Flat					킄	less steel, threaded and flush jointed. 0.010" wire wrap screen	COMMENTS:				
106P06222	S. F				Ė	긬	0.25' welded bottom cap.	Water encounte	red at	5.0' d	uring dr	illing.
1061	Rocky		<u> </u>		<b>-</b> F	ㅋ	CENTRALIZERS Type 304 stainless steel					
		_16			1	ı	5.79' - 6.96'	Top of stainle	ss stee	l casin	g: 2.72	<u>'</u>
5						۱	16 (0 -:1:	Cave from TD t	o 1/. 50	1		
PROJECT					}		FILTER MATERIAL 16-40 silica sand 2.50' - 10.50'	Cave From 1D C	0 14.50			
PR	- 1				ļ		CEMENT Portland Type I					
		- 18				-	0.00' - 2.00'					
					- 1	İ	OTHER 3/8" bentonite pellets				<del></del>	<del></del>
						-	2.00' - 2.50' 10.50' - 14.50'					·
							10.50 14.50		-			
		-20				-						
						لــ	HYDRO-SEARCH RENO*DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGISTS

## ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1386	08/27/86	5837.22	5839.94	2.72	9.50	-1.00	DRY
	09/03/86					-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					11.15	5828.79
	01/01/87					9.71	5830.23
	03/02/87					9.00	5830.94
	04/01/87					9.67	5830.27
	05/06/87					9.67	5830.27
	06/01/87					9.04	5830.90
	07/08/87					9.60	5830.34
	08/04/87					9.10	5830.84
	09/01/87					10.00	5829.94
	09/28/87					9.40	5830.54
	11/03/87					8.80	5831.14
	12/08/87					9.70	5830.24
	01/07/88					7.80	5832.14
	02/04/88					7.70	5832.24
	03/14/88					7.20	5832.74
	04/11/88					8.40	5831.54

13-86 (SP) SATURATED THICKNESS IN WELL #



SATURATED THICKNESS (ft.)

DATE

#### INDEX OF DATA

Boring No.: 14-86							
Completed as well? Yes							
Data in File							
X Log of Borehole							
X Well Construction Summaries							
Well Development Summaries							
X Hydraulic Conductivity Test Data and Results							
X Packer Test Data and Results							
X Water Level Data							
X Saturated Thickness Hydrographs							

Project: Rocky Flats Plant LOG OF BORING NO. 14-86 Coordinates **Date Drilled** 8/19/86; 8/28/86 **Ground Surface Elevation** Boring Method Hollow Stem Auger/NC Core 5846 Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests **Material Description** (Blows/Inch) 20 40 VALLEY FILL ALLUVIUM 0-0.9'-Sample. Recovered 0.9/0.9'=100%. CLAY: dark gray (N 3) clay; some granitic gravel; blocky texture; poorly sorted; unconsolidated; dry. 0.9-4.7'-Sample. Recovered 3.6/3.8'=95%. CLAY: dark yellowish brown (10YR 4/2) and dusky yellowish brown (10YR 2/2) sandy, gravelly clay with some rounded gray quartzite cobbles; few iron stains; poorly sorted; unconsolidated; dry. 4.7-8.0'-Sample. Recovered 3.3/3.3'=100%. CLAY: grayish brown (5YR 3/2) silty clay; granitic gravel and cobbles from 7.7-8.0'; trace of iron staining mottled through entire interval; dry. 8.0-10.5'-Sample. Recovered 2.5/2.5'=100%. CLAY: dark yellowish brown (10YR 4/2) silty clay; some granitic pebbles and cobbles; trace iron staining; damp. Remarks Logged by: L. Pivonka & T. Gulliver Checked by: Project No. Hydro-Search, Inc. 106P06222 Page 1 of 8

Date Drilled 8/19/86; 8/28/86 Coordinates Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5846  Elev. Depth Samte Graphs (feet) Type Log Material Description Pesistance (Blowarinch) 20 40  10 10 10 10 10 10 10 10 10 10 10 10 10 1	Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5846  Elev. Depth Sample Ground Material Description Hesistance (Blowa/Inch) 20 40  10 10 10 10 10 10 10 10 10 10 10 10 10 1	Proj	ect:	Rocky F	lats Plant	LOG O	F BORIN	IG NO. 14	4−86
Claystone: moderate yellowing and ironstone concretions; weathered; dry.   13.0-18.0'-sample.   13.0-18.0'-sampl	(leet) Type Log Material Description (Blows/Inch) 20 40 20 4	Ü				_	rface Elevati		
10.5-11.0'-Sample. Recovered 0.5/0.5'=100%. CLAY: Same as above; damp.  ARAPAHOE FORMATION  11.0-13.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) with light gray (N 7) mottling; some iron staining and ironstone concretions; weathered; dry.  13.0-18.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: Same as above;	10.5-11.0'-Sample. Recovered 0.5/0.5'=100%. CLAY: Same as above; damp.  ARAPAHOE FORMATION  11.0-13.0'-Sample. Recovered 2.0/2.0'=100%. CLAYSTONE: moderate yellowish brown (10YR 5/4) with light gray (N 7) mottling; some iron staining and ironstone concretions; weathered; dry.  13.0-18.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: Same as above; dry.	Elev. (feet)	Depth Semp (feet) Typ	te Graphic e Log	Material Desc	ription	(Blows/inch)	(%)	Ot Te
					Recovered 0.5/CLAY: Same as damp.  ARAPAHOE For the same as damp.  ARAPAHOE For the same as a sa	DRMATION  ple. 2.0'=100%. derate n (10YR 5/4) y (N 7) iron ronstone eathered;  ple. 5.0'=100%.			
18.0-23.0'-Sample. Recovered 2.3/5.0'=46%. CLAYSTONE: Same as above; dry.				Logged 1				Checked by:	
18.0-23.0'-Sample. Recovered 2.3/5.0'=46%. CLAYSTONE: Same as above; dry.  Remarks  Logged by: L. Pivonka & T. Qulliver  Checked by:	Project No.		106P06222		Hydro-	Search,	Inc.	Page 2 of 8	

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Rocky Flats Plant

LOG OF BORING NO.

14-86

**Date Drilled** 

8/19/86; 8/28/86

Hollow Stem Auger/NC Core

Coordinates

Elev. Depth Surrisorachi (feet) Type Log Material Description  20	Bori	ng Method	Hollow S	Stem Auger/NC Core Ground S	Burface Elevat	lon 5846	
23.0-23.3'-Sample. Recovered 0.3/0.3'=100%. CCATSTONE: Same as above; dry.  23.3-25.5'-Sample. Recovered 2.2/2.2'=100%. CCLASTONE: medium dark gray (N 4) claystone; blocky texture; no mottling; unweathered; dry.  25.5-28.0'-Sample. Recovered 2.0/2.5'=80%. CCLASTONE: Same as above; dry.  28.0-30.5'-Sample. Recovered 2.1/2.5'=84%. CIANSTONE: Same as above; dry.	Elev. feet)	Depth Samp (feet) Typ	Graphic e Log	Material Description	(Blows/inch)		Other Tests
		- 27.5-		Recovered 0.3/0.3'=100%. CLAYSTONE: Same as above; dry.  23.3-25.5'-Sample. Recovered 2.2/2.2'=100%. CLAYSTONE: medium dark gray (N 4) claystone; blocky texture; no mottling; unweathered; dry.  25.5-28.0'-Sample. Recovered 2.0/2.5'=80%. CLAYSTONE: Same as above; dry.  28.0-30.5'-Sample. Recovered 2.1/2.5'=84%. CLAYSTONE: Same as above;			

Project No. 106P06222

Hydro-Search, Inc.

Page 3 of 8

Rocky Flats Plant

## LOG OF BORING NO.

14-86

Date Drilled

8/19/86; 8/28/86

Coordinates N 38866.4 E 22737.6

LOG OF BORING NO. Rocky Flats Plant Project: Coordinates N 38866.4 E 22737.6 8/19/86; 8/28/86 Date Drilled -Ground Surface Elevation 5844.71 Hollow Stem Auger/NC Core Boring Method Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests **Material Description** (Blows/Inch) 20 40 20 40 40 41.6-42.3'. CLAYSTONE: black (N 1); carbonaceous; 42.3-46.5'-Sample. Recovered 4.2/4.2'=100%. RQD 3.4/4.2'=81%. 42.3-44.2'. SANDSTONE: light gray (N 7); very fine-grained; moderately sorted; rounded; massive; damp. 44.2-44.4'. CLAYSTONE: greenish gray (5G 6/1); damp. 44.4-46.5'. SANDSTONE: light gray (N 7); very fine-grained; moderately sorted; rounded; massive; damp. 46.5-51.5'-Sample. Recovered 5.0/5.0'=100% RQD 3.6/5.0'=72%.. 46.5-50.6'. SANDSTONE: light gray (N 7); very fine-grained; silty; carbonaceous siltstone laminae; coal coated joints with 40-50 degree dip from 47.5-48.0'; moderately sorted; damp.

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by: \_

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

## LOG OF BORING NO.

14-86

Date Drilled

· 8/19/86; 8/28/86

Boring Method Hollow Stem Auger/NC Core

Coordinates N 38866.4 E 22737.6 Ground Surface Elevation 5844.71

Boring Met	mod nottow	Sten Auger/NC Core Ground Su	FTACE EIGVER	on 5644.71	
Elev. Depth (feet) (feet)	Semple Graphic Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Containt 20 40	Other Tests
50		50.6-51.5'. SANDSTONE: light gray (N 7); very fine-grained; silty; abundant coal partings; moderately sorted; damp.			
-		51.5-52.8'-Sample. Recovered 1.3/1.3'=100%. RQD 1.3/1.3'=100%.		-	
-52.5 -		51.5-52.2'. SANDSTONE: light gray (N 7); very fine-grained; silty; some coal partings; moderately sorted; damp.		111	
-		52.2-52.4'. SANDSTONE: light gray (N 7); fine- grained; abundant carbonaceous detritus; moderately sorted; damp.		-	
-		52.4-52.8'. SANDSTONE: light gray (N 7); fine- grained; laminated; moderately sorted; subrounded; damp.		1 1 1	47
55 - -		52.8-56.3'-Sample. Recovered 2.9/4.5'=62%. RQD 1.8/2.9'=62%. 52.8-53.3'. SILTSTONE:		-	
		dark gray (N 3); clayey; evenly laminated; damp. 53.3-54.0'. CLAYSTONE: grayish black (N 2); 0.10'		- -	-
57.5		thick sandstone beds from 53.7-54.0'; damp. 54.0-55.0'. Lost core. 55.0-56.3'. CLAYSTONE:			•
-		grayish black (N 2); silty; laminated; 15 degree dip; damp.  56.3-60.9'-Sample.			·
-		Recovered 2.8/4.5'=62%. RQD 1.8/4.5'=40%.  56.3-57.8'. CLAYSTONE: dark gray (N 3); silty; laminated; damp.		-	
60		57.8-59.5'. Lost core.		Chacked by:	, HP

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

## LOG OF BORING NO.

14-86

Date Drilled

8/19/86; 8/28/86

Hollow Stem Auger/NC Core

Coordinates N 38866.4 E 22737.6

Ground Surface Elevation 5844.71

59,5-60.9'. SILTSTONE: dark gray (N 3); clayey; laminated; 10 degree dip; damp.  60.9-65.9'-Sample. Recovered 5.0/5.0'=1003. RQD 1.0/5.0'=203.  60.9-63.2'. SILTSTONE: dark gray (N 3); clayey; laminated; 10 degree dip; damp.  61.2-64.5'. Lost core.  64.5-65.9'. SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained; laminated; damp.  65.9-70.9'-Sample. Recovered 5.0/5.0'=1008. RQD 1.6/5.0'=728. SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained; laminated; damp.  70  Remarks Logged by: L. Pivonka 6 T. Gulliver  Checked by:	Depth (feet)			Penetration Resistance (Blows/Inch) 20 40	Containt 20 40	Other Tests
	-62.5 65		dark gray (N 3); clayey; laminated; 10 degree dip; damp.  60.9-65.9'-Sample. Recovered 5.0/5.0'=100%. RQD 1.0/5.0'=20%.  60.9-63.2'. SILTSTONE: dark gray (N 3); clayey; laminated; 10 degree dip; damp.  63.2-64.5'. Lost core.  64.5-65.9'. SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained; laminated; damp.  65.9-70.9'-Sample. Recovered 5.0/5.0'=100%. RQD 3.6/5.0'=72%. SILTSTONE: grayish black (N 2) to light gray (N 7); clayey; very fine-grained;			
	 	1			Out along the	. I.OD

Project No.

Hydro-Search, Inc.

Page 7 of 8

LOG OF BORING NO. Project: Rocky Flats Plant 14-86 Date Drilled 8/19/86; 8/28/86 Coordinates N 38866.4 E 22737.6 Ground Surface Elevation 5844.71 **Boring Method** Hollow Stem Auger/NC Core Penetration Resistance Other Elev. Depth Semple Graphic (feet) (feet) Type Log Tests **Material Description** (Blows/Inch) 20 20 70 . 70.9-74.5'-Sample. Recovered 3.6/3.6'=100%. RQD 2.6/3.6'=72%. 70.9-71.6'. SILTSTONE: Same as above; damp. 71.6-74.0'. CLAYSTONE: grayish black (N 2); silty; laminated; damp. 74.0-74.5'. Lost core. TOTAL DEPTH: 74.5'

Project No.

106P06222

Remarks

Hydro-Search, Inc.

Logged by: L. Pivonka & T. Gulliver

Page 8 of 8

Checked by

WELL	14-86	

	- 1			1 1		•				
	- 1	-o g		<b>201</b>	WELL CONSTR	LICTION SI	INANA	APY		
	·			<b>%</b> ==1	WELL CONSTR	OCTION 3		ANI		
	-		<b>36</b>	<b>%</b> (=-1				50/	711	
	i		<b>36</b>	<b>%</b> ==1		ELEVATION: GROUN				
			<b>36</b>	<b>%</b> ====================================	N 38866.4' E 22737.6	TOP OF	CASING	584	6.73'	
	- 1	10	<b>36</b>	<b>%</b> ==1						
1	- 11	<b>-</b> .~	<b>86</b>	<b>%</b> 4=∃	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
			<b>36</b>	<b>%</b> ==	55 041 74 001	1	STA	ART	FIN	ISH
			<b>8</b> 84	<b>%</b> ==1	TOTAL DEPTH Well: 55.36' Hole: 74.00'	TASK				
- 1			<b>36</b>	<b>24</b> =1	BOREHOLE DIAMETER 0.00' - 30.50': 74"		DATE	TIME	DATE	TIME
			<i>8</i> 66   1	<b>%</b> =1	30.50' - 74.00': 4 3/4"	DRILLING:	1986		1986	
-	4	20	<b>36</b>	<b>%</b> ==1	DRILLER Boyles Brothers Drilling Co.	7½" auger	8/19	1300	8/19	1610
	Ň	- 20		<b>%</b> ==1	15865 W. 5th Avenue, Golden, CO	NC core	8/29	0838	8/29	1343
	Oulliver			<b>%</b> =1		Reaming	9/3	0900	9/3	0917
	ਰ		<b>36</b>	<b>%</b> =1	(Jim Horn, Paul Wiebe) 0.00' - 30.50': Mobile B-57; 30.50' - RIG 74.00': Failing 1500		<del></del>	0,00	<u> </u>	<del></del>
	ij			<b>%</b> =1	RIG /4.00': Failing 1500	GEOPHYS. LOGGING:				
8	es l			<b>‰</b> =:1	BIT(S) 0.00' - 30.50': Blade bit; 30.00' -	CASING:				
- 1	Pivonka/T		<b>82</b>		74.00': Chrisprill 3 3/4", Tricone 4 3/4"	5" steel	8/19	1625	8/20	1008
自	<u>.</u>	30		<b>%</b> ==	DRILLING FLUID 0.00' - 30.50': None	2" stainless	9/3	1100	9/3	1105
Colden.				<b>//</b> ==1	30.50' - 74.00': air/water mist					
٩				<b>%</b> =:1	SURFACE CASING 5" x 33.16 steel w/locking	FILTER PLACEMENT	9/3	1105_	9/3	1200
					Cap Cap		9/3	1200	9/3	1230
_	딥			<b>**</b> F=1	WELL DESIGN:	CEMENTING:	9/5	1130	9/17	1100
LOCATION	SONNE	- 4q			.,,	CEVELOPMENT:	-5/5	-1150	- 3717	-1100
AT	SO		ΠΞI	11	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:	- 1-			
8	ER				CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	9/3	1200_	9/3	1202
_	4.		IJ≣l		0.00' 30.50' C1		9/3	0925	9/3	1020
						Packer testing	9/2	1100	9/2	1700_
		- 5d	<b>∭</b> ≣		<u>39.42'- 55.36' S1 </u>	Cementing 5"	8/20	1008	8/20	1030
_			∭≣I			steel				
										·
						WELL DEVELOR	PMENT			
1			******	==		See Well Devel	oment	Summarv	Sheet.	
1				<b>F</b> =3		OCC HELL BEVEL	Opticite	January		
		<b>–</b> 60			SILT D					
ł					CASING: CI 5" I.D. steel surface casing.					
1	يا				c2 2" I.D. Sch. 5, type 316 stain-					
	Plan				less steel, threaded and flush					
		-			jointed.					
7	Flats	70	***************************************	5	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
106P06222		, ,			less steel, threaded and flush	6011151170				
8	Rocky			[극	jointed, 0.010" wire wrap screen.	COMMENTS:				
$\cong$	ğ				0.25' welded bottom cap.	No water encou	ntered	during	drillin	g
					CENTRALIZERS Type 304 stainless steel					
					<u>46.79' - 48.02'</u>	Top of stainle	es stee	1 casin	g: 2 0'	
ļ		-80			101/2 40.02	_iop or scarnic	33 3466	<u> </u>	<del>5.</del>	
5		1			22 /2 .:1: 20 15!	C 5 TD .	- 60 00	. 1		
PROJECT					FILTER MATERIAL 32-42 silica sand: 38.15' -	Cave from TD t	0 69.00			
280		Ì			55.36'; 16-20 silica sand: 55.36' - 56.85'					
-	•	1			CEMENT Portland Type I					
		_90			0.00' - 35.40'					
					OTHER 3/8" bentonite pellets					_
		1			<u>35.40' - 38.15'</u>					
		1			56.85' - 69.00'					
		L100	)							
					HYDRO-SEARCH RENO*DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGISTS
					TO THE CONTROL TO THE PERSON OF THE PERSON O			55,516		



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LIMITS	CHEET	οŧ	

WONO

TASK DESCRIPTION			TASK NO
PREPARED BY	DEPT	DATE	APPROVED BY
MATH CHECK BY METHOD REV. BY	DEPT	DATE 6/21/8	DEPT DATE
	WEL	14-86	
Hydraulie	Conductivity	(cm/sec)=	1.9 × 10 -7
Flowrate	(gpm) =	0.277gpm	
Screened	Interval (	ft below G.L.) =	39,42 - 55,36'
	39.42-42.	3 claystone	

42.3- 44,2 Sandstone

44.2- 44.4 claystone

44,4- 52.8 sandstone

52.8 - 53.3 siltstone 53.3 - 55.36 claystone (54.0 - 55.0 lost core)

Method of Analysis: residual-drawdown Plat

(Driscoll, 1986 - pg 256.)

CLIENT/SUBJECT

SHEET	-4
SHEEL	OI

CLIENT/SUBJECT	W.O. NO				
TASK DESCRIPTION			TAS	K NO	
PREPARED BY	DEPT	DATE	AP	PROVED BY	
MATH CHECK BY	DEPT	DATE			
METHOD REV. BY	DEPT	DATE	DEPT	DATE	
	WEL	L 14-86			

$$T(grd/ft) = \frac{264Q}{DS'} = \frac{(264)(0.277)}{1121} = 6.52 \times 10^{-2}$$

$$K(qpd/ft^2) = T/b = 6.52 \times 10^{-2}/15.94 = 4.09 \times 10^{-3}$$

This method is valid where usold solving for the for usold

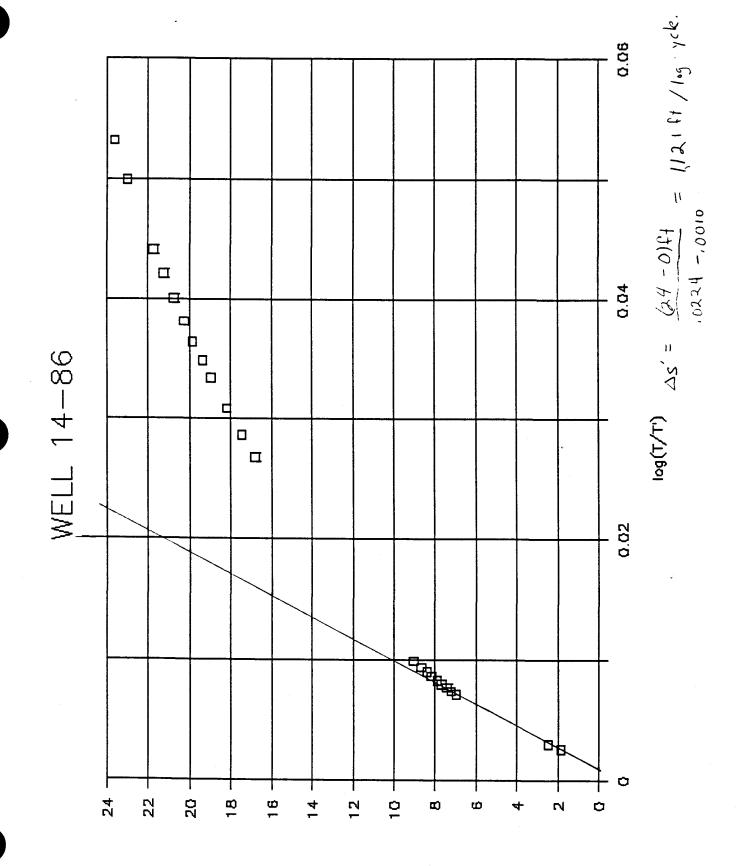
$$\pm \min_{A} = \frac{r^2 S}{4 + u} = \frac{(.2)^2 (10^{-3})}{(4)(6.52 \times 10^{-2})(.01)} \times \frac{1440 \min_{A} \frac{7.482 = a1}{67^2}}{4 a_1}$$

$$= 165 \min_{A} = \frac{(.2)^2 (10^{-3})}{4 a_1} \times \frac{1440 \min_{A} \frac{7.482 = a1}{67^2}}{4 a_1} \times \frac{1440 = a1}{67^2}}{4 a_1} \times \frac$$

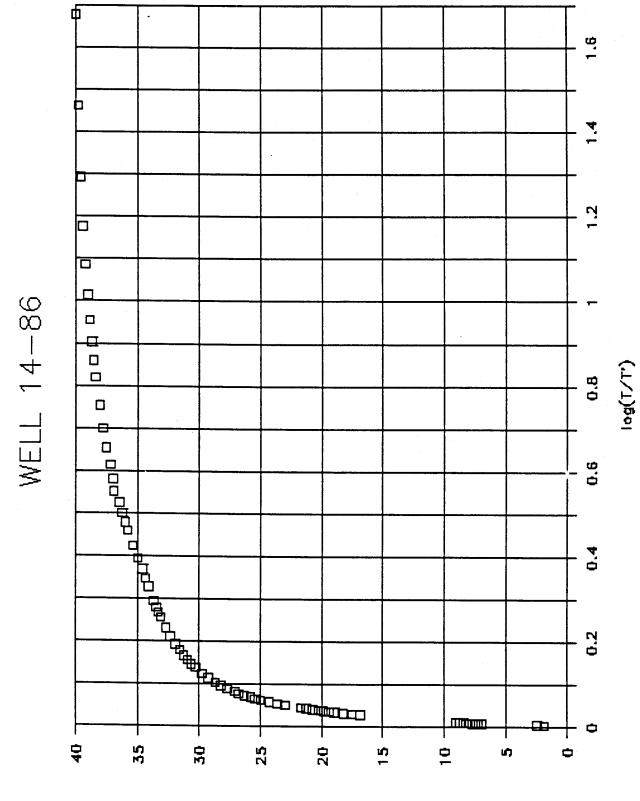
where 
$$r(ft) = \left(\frac{4.75}{24}\right) ft = .20 ft$$

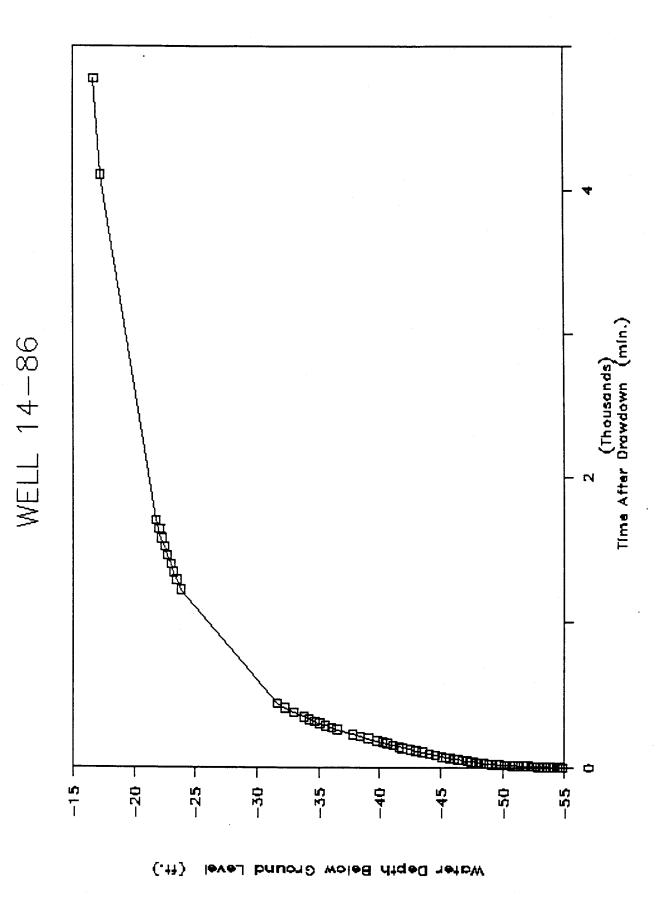
$$S = 10^{-3} \text{ assumed } S \text{ for confined againer}$$

$$DS' \text{ is based on points where } t \ge 1520 \text{ min}$$



Residual Drawdown (ft.)





		WELL 14-8	36	
T	T 1	Water	s'	log(T/T')
Time	T Prime	Level	Rsd Drwdn	
(min.)	(min.)	(ft.)	(ft.)	
28.60	0.60	54.79	39.99	1.68
29.00	1.00	54.59	39.79	1.46
29.50	1.50	54.40	39.60	1.29
30.00	2.00	54.22	39.42	1.18
30.50	2.50	54.03	39.23	1.09
31.00	3.00	53.84	39.04	1.01
31.50	3.50	53.67	38.87	0.95
32.00	4.00	53.51	38.71	0.90
32.50	4.50	53.37	38.57	0.86
33.00	5.00	53.23	38.43	0.82
34.00	6.00	52.86	38.06	0.75
35.00	7.00	52.58	37.78	0.70
36.00	8.00	52.32	37.52	0.65
37.00	9.00	52.00	37.20	0.61
38.00	10.00	51.74	36.94	0.58
39.00	11.00	51.71	36.91	0.55
40.00 41.00	12.00	51.27	36.47	0.52
42.00	13.00 14.00	51.02 50.80	36.22	0.50
43.00	15.00	50.58	36.00 35.78	0.48 0.46
45.00	17.00	50.16	35.78	0.42
47.00	19.00	49.74	34.94	0.39
49.00	21.00	49.44	34.64	0.37
51.00	23.00	49.16	34.36	0.35
53.00	25.00	48.91	34.11	0.33
57.00	29.00	48.48	33.68	0.29
59.00	31.00	48.29	33.49	0.28
61.00	33.00	48.11	33.31	0.27
63.00	35.00	47.93	33.13	0.26
68.00	40.00	47.52	32.72	0.23
73.00	45.00	47.13	32.33	0.21
78.00	50.00	46.75	31.95	0.19
83.00	55.00			0.18
88.00	60.00	46.05	31.25	0.17
93.00	65.00	45.75	30.95	0.16
98.00	70.00	45.44	30.64	0.15
103.00	75.00	45.11	30.31	0.14
113.00 123.00	85.00 95.00	44.57	29.77	0.12
133.00	105.00	44.05	29.25	0.11
143.00	115.00	43.51 43.03	28.71	0.10
153.00	125.00	42.53	28.23 27.73	0.09
	123.00	₹2.33	41.13	0.09

		WELL 14-8	36	
T	T, ¹	Water	s'	log(T/T')
Time	T Prime	Level	Rsd Drwdn	
(min.)	(min.)	(ft.)	(ft.)	
163.00	135.00	41.88	27.08	0.08
173.00	145.00	41.60	26.80	0.08
183.00	155.00	41.12	26.32	0.07
194.00	166.00	40.63		0.07
203.00	175.00	40.28	25.48	0.06
213.00	185.00	39.79	24.99	0.06
228.00	200.00	39.06	24.26	0.06
243.00	215.00	38.43	23.63	0.05
258.00	230.00	37.82	23.02	0.05
290.00	262.00	36.53	21.73	0.04
303.00	275.00	36.06	21.26	0.04
318.00	290.00	35.55	20.75	0.04
333.00	305.00	35.07	20.27	0.04
348.00	320.00	34.67	19.87	0.04
363.00	335.00	34.19	19.39	0.03
378.00	350.00	33.79	18.99	0.03
408.00	380.00	33.01	18.21	0.03
438.00	410.00	32.28	17.48	0.03
468.00	440.00	31.63	16.83	0.03
1248.00	1220.00	23.86	9.06	0.01
1318.00	1290.00	23.49	8.69	0.01
1368.00	1340.00	23.22	8.42	0.01
1428.00	1400.00	23.00	8.20	0.01
1488.00	1460.00	22.70	7.90	0.01
1548.00	1520.00	22.48	7.68	0.01
1603.00	1575.00	22.24	7.44	0.01
1668.00	1640.00	22.03	7.23	0.01
1728.00	1700.00	21.78		0.01
4133.00	4105.00	17.28	2.48	0.00
4803.00	4775.00	16.68	1.88	0.00

### ACHIEFR TEST DATA

AGOIL FULL I FOLLOW	, , , , , , , , , , , , , , , , , , , ,
TYPE OF AQUIFER TEST Pail down - Keinreis	PUMPING OF RECOVERY DATA
HOW A MEASURED 4 & And bucket	PAGEOF
HOW WILL MEACHED VOLVIADIE WELL SOUNDE	EDEPTH OF PUMP/AIRPIPE
RAD. / DIST. OF/FROM PUMPING WELL	PUMP ON: date 3/26/26 time
RAD / DIST, Of / HOW FORM HOUSE	PUMP OFF: date time
MEAS. PUINT FOR W.L.S	DURATION OF AQUIFER TEST
ELEVATION OF MEAS. POINT	
	2474

	EVATION	TIM	E		WATER LEVEL DATA			DISCHARGE		RDED	COMMENTS	
0	CLOCK		_ ar t	-0		CONVERSIONS		s or s'	READ-	Q	RECO	COMMENTS
*	TIME								1140	-		TD = 55.65 A
1		erisina				2,35		NA		-	12	Begin priling
	107	Ø			15+1.83	2,05	140	ø		2 901		5 Eq. (1) (1)
1	11:11											
-	1114	7								1/20/		
<u> </u>	11/6	7						<u> </u>		1 agl	<del> </del>	.,
-	1118	11						<del> </del>			1	
<u>_</u>	1123	16						<u> </u>		Jea 1		
L	1/29	ã2								0,754	4/	
_	1/35	22	ø		ļ						-	0.00
L	1835.38	2,6	20			2.35	54.79	7.99		ļ	+	90% tecevery =
L	136:00				55+1.64			-= 7.79		ļ		
	1/36:30	29.5	1.5		55+1,45			19:00		-	├	
	11370	20	$\partial$		55+1.2			-37.42			-	
L	1/37:3	30.5	2.5		55+1.08	.,		-39.23			<u> </u>	
	1138:00	31	3		15+0.89		53.34	-39.04			-	
	1138:30	31.5	3.5		65+0.7ª			-38.27		-		
	1/39:0	) >2	4		55+0.50		53.51	-38.7/				
	1/37:3	0 22.0	4.5		55+0.40	<del>)</del> .	£3,37	-32,57		<b>↓</b> —	<del> </del>	
	1140:00	ίν. (λ)	5		55+0,2	<b>}</b>	: 3,23	1-32.43		<u> </u>	DP	
Г	141	34	â		50+191		=2.26	-32.36		<b>↓</b>	DP	
	1142	35			50+4.63		52,58	-37.72			DP	
	11 43	33	-		50+ 4.37	1	za. 32	-37.52		<u> </u>	10H	ļ
	1/94	ي ٿ	2		50+4.0		52.00	-27.20		<u> </u>	1404	
	1145	حق	/2		50+3.79		51.74	-36.74			WH	·
	1146	7.3	1		50+3.50	1		.76.3/			WH	
	1147	72	्र		50+3.3			-36.47			wit	
	11482	41	1/2		50+3.01			-36,22			WH	
	1149	42	14		50+285			-36.00			WH	
	1150	47			50+263			-3 5.78			DP	
1	1152	iic	17		50+2.21		50.16	1 . 1			DF	}
-	1154	-7	113		50+1.7			-34.94			WH	
-	1156	250	2/		50+1,4	1		-34.64			WA	
	1158	5.	2.3	<b></b>	50+1,21		49.16				w T	+
	1200	53	2.5	$\vdash$	50+0.4	1	42.91	-34.11			DP	
-	1200	55	6.7		50 + 0.74			-33.29			DP	
		35	0.7	<del>                                     </del>	50+0.50		42.40				4111	
-	1204	3 2	57	1	50+0.34		40,29				3/11	
-	1208		33	1	50+0.16		43.11	-33.3/			WH	
-	1210	23	35	1	4514.98			-33,/3		T	DP	
-		7	40	1	45+4.57			7-32.72			WH	
-	1215	17 2	<u> </u>		15,410			33	<del></del>	1	DP	

HYDRO-SEARCH

RENO . DENVER

CONSULTING HYDROLOGISTS-GEOL

### AQUIFER TEST DATA

PUMPING OF OBSERVATION WELL TYPE OF AQUIFER TEST PAIL
HOW Q MEASURED 75 0 PUMPING OF RECOVERY DATA PAGE 2 gallow HOW Q MEASURED. DEPTH OF PUMP/AIRPIPE SLYMPIL HOW W. L.'s MEASURED \_\_\_ PUMP ON: date\_ time. RAD./DIST. OF/FROM PUMPING WELL \_ PUMP OFF: date\_ time\_ MEAS. POINT FOR W.L.'s -M. side of innercosi DURATION OF AQUIFER TEST ELEVATION OF MEAS. POINT

WELL\_

			=			T							_	
	TIME t= <u>೩೪.೨</u> at t'= o					WATER LEVEL DATA STATIC WATER LEVEL					DISCHARGE		ORDED 3Y	COMMENTS
	O A	CLOCK	(min)	(mic)		1	CONVERSIONS		3 OF) "		READ-	Q	REC	
_ [	/	12:25	78	50		45+3.80			-31.95				WH	
11:4		IZ:30	83	55		4513.45	1		-31,60				De	
20		12:35	82	60		45+3.10			-31,25				OP	
3		12:40	93	65		45 + 2.80			-30.95				ص	
4		1245	98	70		45+2.4			-30,64				DO	
		1250	103	75		15+216		45.11	-30,31			Ĺ	00	
Herst		1256	107	30		-							op	
1		1300	// <i>3</i>	- :-		45.1.62		4757	-27.77				DP	
3		11:10	/ <b>2</b> 3	95		45+1.10			-29,25				A)	
7		12-0	733	105		45+0.56		43,51	-28.7/				Dr.	
ا نے		7:10	143			45 - 0.08		43,33					DP	
Ž.		1340	153	125		40+4.58			-27.73				OP	
SOI			1650			40+ 3.93		41.28					OP	
PERSONNEL		14700	172	145		40+ 3.65		41.60	-26,80		Ţ		DP	
- 1		1110	123	155		40+3.17		41.12	-26,32				DP	
Ī		14.1	194	166		40 +2.68	,		-25.23				WH	
Ī		1430	203	175		40 + 2.33			-25,48				20	
ا ، ا		1.1-16	2/3			40+1.84		-2.79	-24.99				NP	
						40+ 1.11		29.06	-24,26				DP	
			243			40+0.48			-23,63				wit	
		15:35	258			354.87		37.82					101	
			220			35+3,58			-21,73				HILL	Addas with som
			3.3			35+3.11		ور ح					441	Had to so not a
		16:25	,	270		25,260			-20.75				كعودما	new ore
2		16.40				35+2.12		35.07	-20,27				t) H	
200			348			35+1,72		34.67	-19.87				L) H	
P06		17:10	363			35+1-24		34.19	-19.39				USH	
7 1		17:25		350		25+0.84		37.79	-18.99					
1		1755	408			75+0,06		33.01	-18.21					
9			438	410		30+4,33		32,22	-17.48					
			468			30+3.68	1		-16,83					
	2	The second of the second	1240			25+0.91	177		-7,06				118.	Roder Hill Gorn
:			12/8			25+ 354	1		-2,69				MB	
			1763			25+0.27			-242		1		MB	
			1428			25+0.05			-020				MB	
٠ ' ا				1460		204 2.75			-7.90				MB	
			1548			20+4.53			-7.62				MP	
Ì			1603	1-		20 + 4.29			-7,44				RIL	
	$\sqcap$		1668			20+4.08	1		-7.23				ME	
Ì	2		1722			20 + 383			-6.98				MM	•
			4/33			15+4.33			-2.48				WH	740% Karavery

PROJECT

LOCATION \_

HYDRO-SEARCH

15+3.73 RENO . DENVER

wH CONSULTING HYDROLOGISTS-GEOLOGISTS

#### PACKER TEST ANALYSIS

WELL NO. 14-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/2/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 32.46 - 43.64 MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 10.86

K = ----- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00045692 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 2.30 \* 2.31 = 18.07

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000154 FT/MIN

K = .00000078 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00429001 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 11.00 \* 2.31 = 38.17

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000683 FT/MIN

K = .00000347 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00052039 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 2.40 \* 2.31 = 18.30

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000173 FT/MIN

K = .00000088 CM/SEC

### PACKER TEST ANALYSIS WELL NO. 14-86

ROCKY FLATS PLANT JOB NO. 106P06222
DATE TESTED: 9/2/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 43.26 - 54.44

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 10.86

$$K = \frac{Q}{2(PI)(L)(H)} LN(--)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00122100 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 2.20 \* 2.31 = 17.84

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000416 FT/MIN

K = .00000211 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00797079 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 9.00 \* 2.31 = 33.55

R = BJREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001444 FT/MIN

K = .00000734 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00037995 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 2.30 \* 2.31 = 18.07

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000128 FT/MIN

K = .00000065 CM/SEC

#### PACKER TEST ANALYSIS

WELL NO. 14-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/2/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 53.91 - 65.09

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 10.86

K = ---- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 1.70 \* 2.31 = 16.69

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000049 FT/MIN

K = .00000025 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00457975 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 20.00 \* 2.31 = 58.96

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000472 FT/MIN

K = .00000240 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013962 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 10.86 + 1.90 + 2.40 \* 2.31 = 18.30

R = BOREHOLE RADIUS = .16 FEET

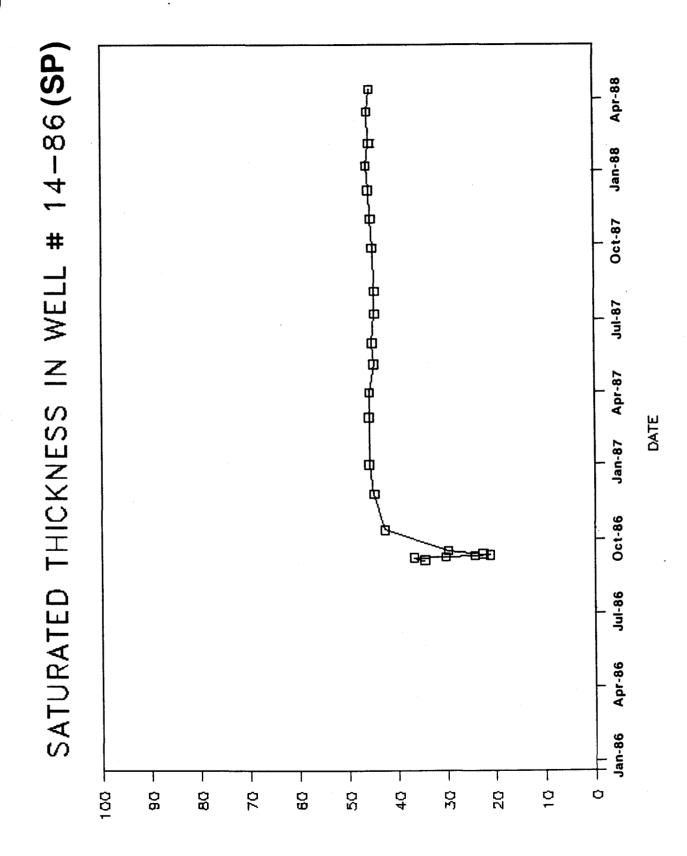
K = HYDRAULIC CONDUCTIVITY = .00000046 FT/MIN

K = .00000024 CM/SEC

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1486	09/05/86	5844.71	5846.71	2.00	55.36	20.90	5825.81
	09/08/86					18.79	5827.92
	09/09/86					25.22	5821.49
	09/11/86					31.12	5815.59
	09/12/86					34.23	5812.48
	09/13/86					32.84	5813.87
	09/17/86					25.68	5821.03
	10/13/86					12.91	5833.80
	11/26/86					10.64	5836.07
	01/01/87					9.67	5837.04
	03/02/87					9.67	5837.04
	04/01/87					9.85	5836.86
	05/06/87					10.77	5835.94
	06/01/87					10.39	5836.32
	07/08/87					10.90	5835.81
	08/05/87					10.90	5835.81
	09/28/87					10.50	5836.21
	11/03/87					10.20	5836.51
	12/08/87					9.70	5837.01
	01/07/88					9.30	5837.41
	02/04/88					9.90	5836.81
	03/14/88					9.60	5837.11
	04/11/88					10.10	5836.61

SATURATED THICKNESS (ft.)



### INDEX OF DATA

Boring No.: 15-86								
Completed as well? Yes								
Data in File								
X Log of Borehole								
X Well Construction Summaries								
Well Development Summaries								
X Hydraulic Conductivity Test Data and Results								
Packer Test Data and Results								
_x_ Wator Level Data								
X Saturated Thickness Hydrographs								

Project:

Rocky Flats Plant

## LOG OF BORING NO. 15-86

Date Drilled 8/18/86

Boring Method -

Hollow Stem Auger

Coordinates N 38862.9 E 22711.3 Ground Surface Elevation 5845.61

Boring Method: Hollow Stem Auger Ground Surface Elevation 5845.61							
(feet) (feet) fy	mple Graphic /pe Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests		
Elev. (feet) Ty		VALLEY FILL ALLUVIUM  0-0.4'-Sample. Recovered 0.4/0.4'=100%. Medium CLAY: dark gray (N 4) top soil; trace granitic pebbles; poorly sorted; unconsolidated; dry.  0.4-5.0'-Sample. Recovered 4.0/4.6'=87%. GRAVEL: dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2) granitic and micaceous pebbles and cobbles with some clayey silt; poorly sorted; trace of iron stains; unconsolidated; dry.  5.0-6.0'-Sample. Recovered 1.0/1.0'=100%. GRAVEL: moderate yellowish brown (5YR 3/4) and pale yellowish brown (10YR 6/2) granitic pebbles and cobbles in a sand and silt matrix; poorly sorted; unconsolidated; dry.  6.0-8.0'-Sample.	Resistance (Blows/Inch)				
20		sorted; unconsolidated; wet.  ARAPAHOE FORMATION	1 1 1 1	- - - -			
Remarks	Logged by:	L. Pivonka	Checke	ed by: JUP			

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 2

Project:

Rocky Flats Plant

### LOG OF BORING NO. 15-86

Date Drilled 8/18/86

Coordinates N 38862.9 E 22711.3

Boring Method

Hollow Stem Auger

Ground Surface Elevation 5845.61

Bori	Boring Method Hollow Stem Auger Ground Surface Elevation 5845.61								
Elev. (feet)	Depth Ser (feet) Ty	nde Graphic pe Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Consent 20 40	Other Tests			
Elev. (feet)	20	mple Graphic pe Log	Material Description  12.5-13.0'. CLAYSTONE: dark yellowish brown (10YR 4/2); trace iron staining; weathered; moist.  13.0-15.5'-Sample. Recovered 2.5/2.5'=100\cdot\cdot CLAYSTONE: light olive gray (5Y 6/1) and dusky yellowish brown (10YR 2/2); weathered; dry.  15.5-18.0'-Sample. Recovered 2.5/2.5'=100\cdot\cdot CLAYSTONE: light olive gray (5Y 6/1); trace iron staining; weathered; dry.  TOTAL DEPTH: 18.0'	(Blows/inch)	(%)	Tests			
	-35 -40	Logged by	: L. Pivonka		red by:				
Pro	ject No. 106P06	222	Hydro-Search,	Hydro-Search, Inc.					

WELL	15-86	

			**				
	- 0	WELL CONSTR	RUCTION S	UMM	ARY		
		- LOCATION or COORDS:	ELEVATION: GROUP		5.8	45.611	
		N 38862.9 E 22711.3		F CASING		47.93'	
1		DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
		TOTAL DEPTH Well: 14.69' Hole: 18.00'		ST/	ART	FIN	SH
		BOREHOLE DIAMETER 74"	TASK				
		BOREHOLE DIAMETER	DRILLING:	<b>DATE</b> 1986	TIME	1986	TIME
		DRILLER Boyles Brothers Drilling Co.	7년" auger	8/18	_1405	8/18	1705
	「	15865 W. 5th Avenue					
	1     2	Golden, CO (Jim Horn)					
		RIGMobile B-57	GEOPHYS. LOGGING:				
.g		BIT(S) Bull mose bit	CASING:				
<u>Pivonka</u>	L <sub>1</sub>		2" stainless	8/18	1705	8/18	1707
PJ:		DRILLING FLUID None					
-1	1 章						
	V20101111111111111111111111111111111111	SURFACE CASING 5" x 5' steel w/ locking cap	FILTER PLACEMENT	1	1707	8/18	1720
EL		WELL DESIGN:	CEMENTING:	<u>8/18</u> 8/27	1725 1205	8/18 9/9	1730 1000
PERSONNEL	20	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	CEVELOPMENT:	0/2/	1203	3/3	1000
RS		CASING STRING(S): C=CASING S=SCREEN	OTHER: Bentonite	8/18	1720	8/18	1722
4		0.00' 4.09' C1	Dentonice	-0/10-	1720	07.10	1722
		4.09'- 14.69' S1 -					
	_25						
			WELL DEVELOR	DMENT	! ***	' '	
			WEEL DEVELOP	- MC141			
	30		See Hell Devel		C	Chast	
	┝~	CASING: C1 2" I.D. Sch. 5 type 316 stain-	<u>See Well Devel</u>	opnent	Summary	Sneet.	
		less steel threaded and flush					<del></del>
		_jointed.					
ant						•	
E.	<del>-</del> 35	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
ats Pla		less steel, threaded and flush	COMMENTS:				
Rocky F1		jointed, 0.010" wire wrap screen	}				
श्र		0.25' welded bottom cap.	<u>Water encounte</u>	red at	6.5' d	uring dr	illing.
Z	40	CENTRALIZERS Type 304 stainless steel 8.34' - 9.52'	Top of stainle		1	~· 2 2	21
	<b>-</b> 40	<u> </u>	100 Or scarnie	ss siee	I Casin	8. 4.3	4
		FILTER MATERIAL 12-20 silica sand					· · · · · · · · · · · · · · · · · · ·
		3.00' - 18.00'					
1		CEMENT Portland Type I					
	L 45	0.00' - 2.00'			,		
		OTHER 3/8" bentonite pellets					<del></del>
		2.00' - 3.00'					
	1 1		l ————				

HYDRO-SEARCH RENO-DENVER

Colden, Co

LOCATION

106P06222

PROJECT \_\_

**-** 50

CONSULTING HYDROLOGISTS-GEOLOGISTS



CLIENT/SUBJECT			W.O. NO
TASK DESCRIPTION			TASK NO
PREPARED BY	DEPT	DATE	APPROVED BY
MATH CHECK BY	DEPT	DATE	
			DEPT DATE

WELL 15-86

Hydraulic Conductivity = NA

Flowrate (gpm) = 0,872

Screened Interval (ft below G.L.) = 4,33 (Static W.L.) - 14,69'

Method of Analysis: Residual - drawdown Plot
(Driscoll, 1986 pg 25%).



SHEET\_\_\_\_ of \_\_\_\_

CLIENT/SUBJECT			W.O. NO	
TASK DESCRIPTION				
PREPARED BY	DEPT	DATE	APPROVED BY	
MATH CHECK BY	DEPT	DATE		
			DEPT DATE	

WELL 15-86

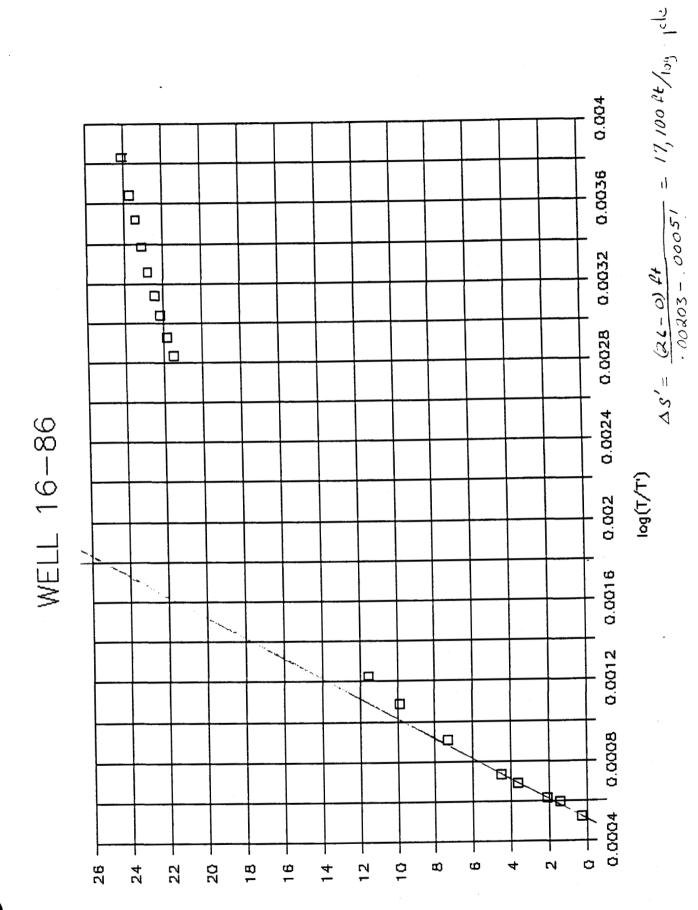
$$T (gpd/ft) = \frac{264Q}{25'} = \frac{(264)(0.872)}{24} = 9.59$$

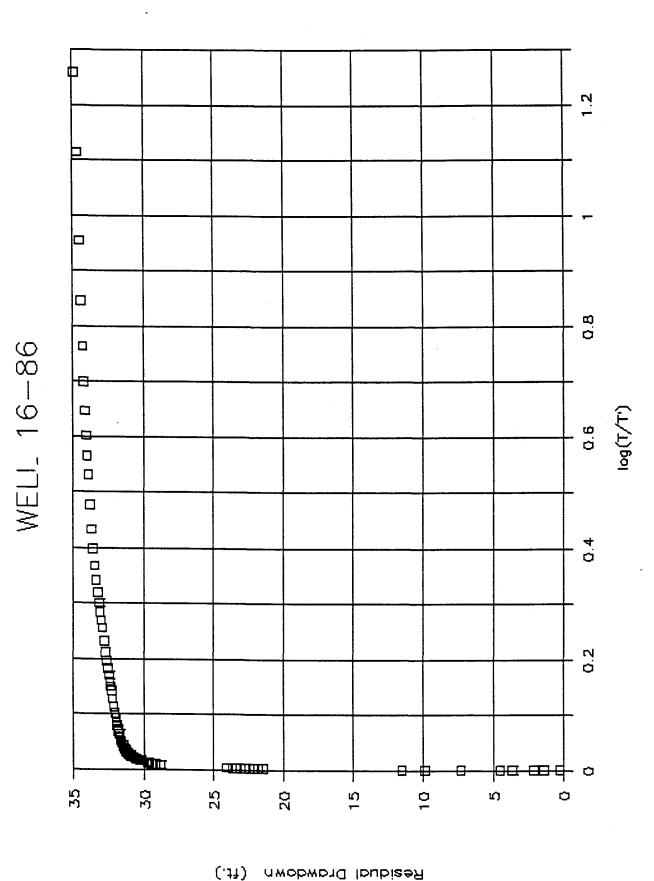
$$K(qpd/ft^2) = T/b = 9.59/10.36 = .926$$

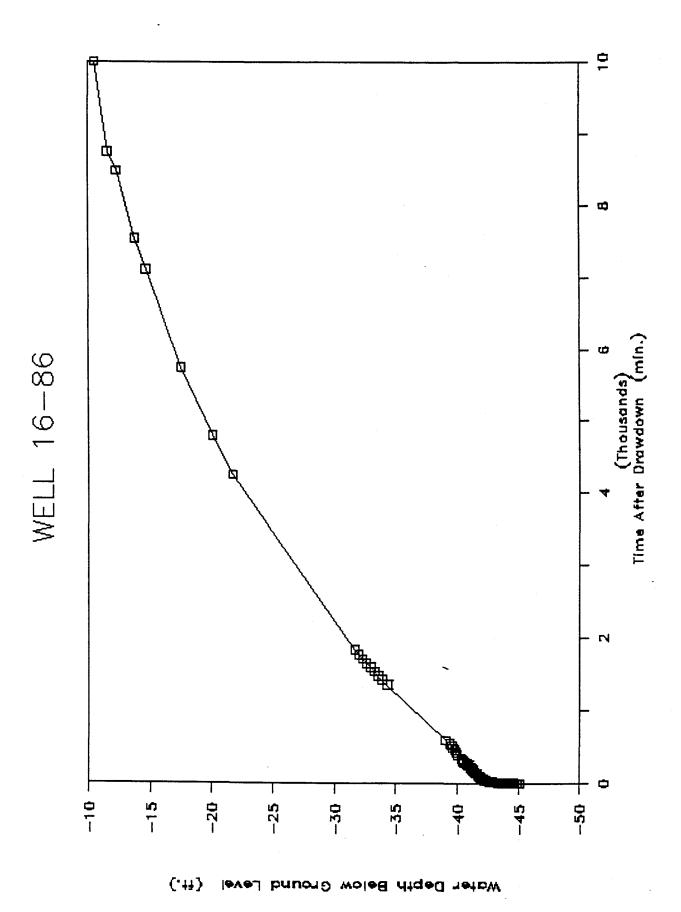
nis method is varid where u < 0.01 solving for t for u < 0.01.

$$t = \frac{r^2 S}{4 T u} = \frac{(.3)^2 \times .1}{4 (9.59) (.01)} \times \frac{1440 min}{4 a_1} \times \frac{7.482 \text{ cal}}{43}$$

where 
$$r(3t) = \frac{7.25}{24}ft = (0.30)ft$$
  
 $S = 0.1$  assumed  $S$  for unconfined aguiters.  
 $\Delta S'$  is invalid.







T Time (min.)	T' T Prime (min.)	WELL 16-86 Water s' Level Rsd Drw (ft.) (ft.)	
137.00 147.00 157.00 167.00 177.00	125.00 135.00 145.00 155.00 165.00	(ft.) (ft.)  41.63 31.4  41.52 31.3  41.44 31.2  41.43 31.2  41.34 31.1	0.04 0.04 0.04 0.03 0.03
187.00 197.00 212.00 227.00 257.00 272.00	175.00 185.00 200.00 215.00 245.00 260.00	41.30 31.1 41.29 31.1 41.17 30.9 41.11 30.9 40.86 30.6 40.77 30.5	0.03 11 0.03 99 0.03 93 0.02 58 0.02
287.00 302.00 317.00 332.00 347.00 401.00	275.00 290.00 305.00 320.00 335.00 389.00	40.69 30.5 40.58 30.4 40.47 30.2 40.40 30.2 40.32 30.3 39.97 29.3	10       0.02         29       0.02         22       0.02         14       0.02         79       0.01
437.00 467.00 497.00 527.00 557.00 596.00	425.00 455.00 485.00 515.00 545.00	39.92 29.5 39.77 29.5 39.64 29.4 39.54 29.5 39.36 29.5 39.04 28.8	59       0.01         46       0.01         36       0.01         18       0.01         36       0.01
1366.00 1436.00 1486.00 1546.00 1606.00 1666.00 1721.00	1354.00 1424.00 1474.00 1534.00 1594.00 1654.00 1709.00	34.26 24.0 33.86 23.0 33.58 23.0 33.29 23.0 32.96 22.0 32.61 22.0 32.32 22.0	68       0.00         40       0.00         11       0.00         78       0.00         43       0.00
1786.00 1846.00 4257.00 4809.00 5756.00 7116.00 7551.00	1774.00 1834.00 4245.00 4797.00 5744.00 7104.00 7539.00	32.00 21.3 31.67 21.3 21.72 11.3 20.06 9.3 17.50 7.3 14.70 4.3	82       0.00         49       0.00         54       0.00         88       0.00         32       0.00         52       0.00
8491.00 8756.00 10011.00	8479.00 8744.00 9999.00	13.83 3.12.31 2.11.62 1.10.50 0.	13 0.00 44 0.00

			WELL 16-8	36	
	T	T'	Water	s'	log(T/T')
	Time	T Prime	Level	Rsd Drwdn	
1	(min.)	(min.)	(ft.)	(ft.)	
	12.70	0.70	45.06	34.88	1.26
	13.00	1.00	44.87	34.69	1.11
	13.50	1.50	44.69	34.51	0.95
	14.00	2.00	44.59	34.41	0.85
	14.50	2.50	44.46	34.28	0.76
	15.00	3.00	44.39	34.21	0.70
	15.50 16.00	3.50	44.32	34.14	0.65
	16.50	4.00 4.50	44.25	34.07	0.60
	17.00	5.00	44.17 44.09	33.99	0.56 0.53
	18.00	6.00	43.99	33.91 33.81	0.48
	19.00	7.00	43.88	33.70	0.43
	20.00	8.00	43.76	33.58	0.40
	21.00	9.00	43.64	33.46	0.37
	22.00	10.00	43.54	33.36	0.34
	23.00	11.00	43.44	33.26	0.32
	24.00	12.00	43.35	33.17	0.30
	25.00	13.00	43.27	33.09	0.28
	26.00	14.00	43.19	33.01	0.27
	27.00	15.00	43.12	32.94	0.26
	29.00	17.00	43.00	32.82	0.23
	31.00	19.00	42.88	32.70	0.21
	33.00	21.00	42.79	32.61	0.20
	35.00	23.00	42.68	32.50	0.18
	37.00	25.00	42.62	32.44	0.17
	39.00	27.00	42.57	32.39	0.16
	41.00	29.00	42.52	32.34	0.15
	43.00	31.00	42.43	32.25	0.14
	47.00	35.00	42.38	32.20	0.13
	52.00	40.00	42.31	32.13	0.11
	57.00 62.00	45.00	42.22	32.04	0.10
	67.00	50.00	42.13	31.95	0.09
	72.00	55.00	42.12	31.94	0.09
	77.00	60.00 65.00	42.07 42.00	31.89	0.08
	82.00	70.00	42.00	31.82	0.07
	87.00	75.00	41.98	31.80 31.74	0.07
	92.00	80.00	41.92	31.74	0.06
	97.00	85.00	41.85	31.67	0.06 0.06
	107.00	95.00	41.82	31.64	0.05
	117.00	105.00	41.75	31.57	· 0.05
	127.00	115.00	41.65	31.47	0.04
				02.37	0.04

		TYPE OF A	QUIFER 1	TEST	F	FER J. Now	n- Ko				PU: PU	MPING MPING	or OB	SERVATION WELL COVERY DATA OF
0	1	HOW W. L.1	MEAS!	JRED _	OL	Mod but	sell so		DEPTH OF PUMP ON:	date	IRPIPE		tin	ne
Č		MEAS. POI	NT FOR	W.L.'s -	M.S.	de tin	101 ( 39)	<del></del>	PUMP OFF:				tir	ne
₹		LEVATION	N OF MEA	S. POIN	T								١٥	
boinery		t=_	TIM _/&	E _ at t	′= o	STATIC	WATER L	R LEVEL	10,18	- <del>'</del> +	DISCH	IARGE	ORDE	COMMENTS
1.		CLOCK		11		READING	CONVERSIONS CORRECTIONS	WATER	s 97,81		READ-	Q	REC	
Pant, Parlock	ı	10109		( M.M. /			2,08		ø				WH	
2 4		09/4				1	132700	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					1.1	T.D. = 45.09+
Plant			1,25				•				120/		7.	Rail 1 sollow
	١		2,75								2001		17	Bail 1 sallar
Flas			4,4								1991			Pail 1 ralloy
1 ×		0900:0									1901		, .	Pail 1 millon
7 %			5 2.1								1 901			Fril & sullar
1.110			10.75								101			Early miller
<u> </u>			0 /2	10							J			Pennie haler
7 3	-		0 10,7	2,7		454214	2.28	45.20	ميم بهت					9090 recorn= 1367
یے ا		09:07:0		/		451,93			الروز بلدة				·	
NON	Ī		n 135	1,5		45+1.77		44.69						
ATI		1922 a		2		45+1.67		44.59	- 447					
LOCATION PERSONNEL		1929:3	3 14.5	2,5		45+1.54		44,46	-24.28		<u> </u>		1.7	
			215	(3)		45+1.47		44.39	-34,21				,,,	
			30 15,5	3,5		45+1.40		44.32	-74,14				.,	
		0930:0	16	4		15+1,33			-34.07					
1	. [	0930:3	16.5	4,5		45+1,2	5	44,17	-33,99				1.	
		93/:	12/7	<		45+1.17		44.09	-33,91					
		0930	18	6		15+1.01		43,99	-33,2/					
		07:30	0 19	7		450.96		لإح. 34	- 33.70					
		09341	00 00	2-		45+0.8+			-33.52					
		39368	021	7		1540,72		43.54	- 17.46					
		0936:0	00	10		45+0.60		43.54	236		ļ			
222		1770	0 23	11		15+0.50	٠,	43.44	-35,26		<u> </u>			
1		0938	24	12		45+0,43		43,35	-:33./7				<u> </u>	
90-190		27390	25	/3		450,35			-73,09				"	
3		0910:0	26	14		45+0,27		43,19	-33.0/					
2		0941:0	27	15		45+0,20			-32.94				<u> </u>	
		0943:	29	17		45+0.08		43.00	2,02		ļ			
		0945	3/	19		+34.96	<u> </u>		-32,70		ļ			
		-044	33	21		4014.77	<u> </u>		-32,61		ļ			
7		0949		23		4) -4.76			-32,50		-			
PROJECT		2.51	37	25		40+4.70			-32.44		-		-	
PR		11953	39	27		40+4,65			-32.39		+			
		0955		29		40+4.60			- 32,34		-	ļ	-	
		-257		3/	<u> </u>	40+4,51			- 32.20		-		-	
		- 759	45	33		40+4.5			-3225		-		1	
		1301	47	25		40+ 4.46			1-32,20		-		-	
	- 1	1,00 4	1 62	40	1	W24 29	7	1475/	1-22/7	ı	1	1	1	I

### AQUIFER TEST DATA

WELL 16-86	
PUMPING or OBSERVATION	WELL
PUMPING OF RECOVERY DAT	Ά
PAGE 2 OF 3	-

		НС	W W. L.	's MEA	SURED	O4 y ,	gallow - Sic wel	1 Sounds		DEPTH OF	PUMP/AII				OF3
0			MEAS. POINT FOR W.L.'s No Sale of Lener Casing								PUMP ON: date time				
Ü														me	
3	,	5	ELEVATION OF MEAS. POINT								DURATION OF AQUIFER TEST			<b>~</b>	
6000FA				TII				WATE	R LEVE	DATA		DISCHARGE READ- ING Q		SED.	
2		L	t=_		<u>at</u>	t'= 0	STATIO	WATER L	EVEL	10.18		01001		808 808	COMMENTS
1		Ŷ	CLOCK		(min)		READING	CONVERSIONS CORRECTIONS	WATER LEVEL	5 OF 5'		READ- ING	Q	REC	
1	X	1	10/6	62	50		40+4,21	-208	42,13	-31,95				ω#	2" STICK VP
Plant,	7.77		1021	67	55	-	40+4,2	11	42,12	-31.94				υ#	
D	10,1	<u>  ''</u>	1026	72	60		40+4,15		42.07	-31.29				<u>ა⊬</u>	
i	3	1.,	103/	77	65		40+4.08	11	42.00	-31.82				w H	
Flak	7	"	1036		70		40+4.06	. , ,	41.98	-31.80				٨ري	
I		Ŀ	1041	27	75	1	40+4.00	. /		-31.74				wr	
- 1	457	<u></u>	1046		80		40+3,34	3.7	41.86	-31,68				WH	
Recky	X	L	1051	97	25	1	40+3.13		41,25	-31.67				w#	
6	3	L	1/01	107	75		4013.30		41/82	-31,54				w#	
18	,3	L	1111	117	105	1	ق کے	,	4175	-31,57				w⊬	
	E	Ľ	1121	127	1/15		44313.25	.,	71.65	-31.47				WH	
LOCATION	PERSONNEL	17	1121	137	125	1	40+3,71		41.63	-31.45				ωH	
SAT	350	,	1141	147	135	1	40.3 3		41.52	-31,34				wH	
20	PEI	,,	1151	157	145	1	40+3.50	17	41.44	-31,26				WH	
		10	~ '/	167	155	1	41043,51		41.43	-31,25				6)/*	
_		<u>"</u>	1/2/1	177	165	1	40+372		41,34	-31,16				w#	
		1.	1221	187	175	1	4843.32		41,30	-3/./ <b>2</b>				WH.	
1	1	"	1251	197	185		-19237		41.29	-31.11				w/	
		'.	246	2/2	200		4023,25		41.17	-30.99				NH	
		1.	1321	227	215		431311	1.	41.11	-30,93				wH	
		Ŀ	13/1	242	230		40+3 37		41.01	-30,83				W#	
			123:	257	245	1	40+2 74		40.26	-30,68				أغمال	
			1376	272	260	7	4010 0		40,77	-30,59				W+4	
7			1-17	227	275	1	1/142.77		40.69	-30,51			Į.	n#	
2			14/3	302	290		401266		40,58	-33,40			Ì	MW	
2			1431	317	305	1	4012.55		40,47	30,29				こて	
206		4	المتعانور	332	320		40+50-41		40,40	-30.16				NH	
			150	347	335	1	40+2.40		40,32					wr	
100		Ш	1555	401	729		4012.05		39.97	-39.79				WH	
7			1631	427	425		10+200		39,92					MW	
			1701	467	455		40+1.85	. •	31.77	-29.59				D)#	
			1731	497	485		40+1.72			-29.46				4 17	
CT		ĿJ	1:01	527			40 + 1.62			-29,36				ه	
PROJECT			1231	557	545		40+1.44			-22/8				20	
PRC			1910		لمدين		40+1.12			-28,86				14	
. –					1.576	x 13HE	- DEIL NA								Hiter 13 hours
		2	8:20	13/26	1354		35. 4.34	Ţ. 58	34,26	-24,08				1	overnite
		''	39:10	1436	1424		35.+0.94			-23.68				1	
		٠,	10100	1486	1474		35+ 0.66		33 B					P	

HYDRO-SEARCH

RENO . DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

## AQUIFER TEST DATA

PUMPING OF CHECOVERY DATA

								PAGE 3 OF 3					
								PUMP ON: date time				ne	
MEAS. POINT FOR W.L.'s - No side - Casica							irs	PUMP OFF: date				tia	me
EL	EVATION	N OF MEA	S. POIN	т		?		DURATION	OF AQUII				
TIME t = at t' = 0				WATER LEVEL DATA STATIC WATER LEVEL 10.18				DISC	HARGE	RDED	COMMENT		
D A	CLOCK		1'		READING	CONVERSIONS	WATER LEVEL	s or s'		READ-	Q	RECO	COMMENT
	B:00:00		1654		30+4.6			-22,43				1	
			1709		20+4.40			-22.14			1	30	
1		10/786			30+4.08			-21,82			6	10	
+	,	1246			30 +3.75		31.67					20	
4			4245	-	30+3.80		21.72	-11,54				WH	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
4		4809		· · · · · · · · · · · · · · · · · · ·	20+2.14		20,06	2.04		1		W4	<u> </u>
5		5756			15+4.58		17,50			1	<b>†</b>	wit	90%=1367 /
5		6 176			15+3.73		17.65			<del> </del>		00	1-11-1-11
$\overline{z}$	08:30				15 +1.78		14.70	-4.52			1	0.	
<u>ر</u> دم	15:45				15+0.91		13.83	-365		<u> </u>	<del> </del>	D	
			8.479	·	10+4.39		12.31	-2.13				P	
_	17.50		8744		N+3.70		11.62	-1.44		<del>                                     </del>		ا گرال	
_	0945		9999		10+3.58		10.50	p. 32		<del>                                     </del>		00	90%+ Recon
_	<u> </u>	70.00	7777		70-3-30		10.5	10.00				77 -	oHained
					<u> </u>		<del> </del>						<u> </u>
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									<del></del>				
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٦					<del>                                     </del>				<del></del>	<del>                                     </del>	<del>  </del>		

### PACKER TEST ANALYSIS WELL NO. 16-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/27/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 28.68 - 38.68
MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00147231 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 2.70 \* 2.31 = 12.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000766 FT/MIN

K = .00000389 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00332177 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 4.00 \* 2.31 = 15.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001397 FT/MIN

K = .00000710 CM/SEC

2ND P1/3 TEST

TEST ABORTED

### PACKER TEST ANALYSIS

WELL NO. 16-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/27/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 34.43 - 44.42 MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = ---- LN(--)$$
2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00057539 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 2.80 \* 2.31 = 12.88

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000294 FT/MIN

K = .00000149 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00089354 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 7.80 \* 2.31 = 24.43

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000241 FT/MIN

K = .00000122 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00093416 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 2.53 \* 2.31 = 12.25

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000502 FT/MIN

K = .00000255 CM/SEC

#### PACKER TEST ANALYSIS WELL NO. 16-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/27/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 42.59 - 52.59

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 5.09

$$K = ---- LN(--)$$
2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00002031 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

5.09 + 1.32 + 3.80 \* 2.31 = 15.19

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000009 FT/MIN

K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00114462 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

5.09 + 1.32 + 10.00 \* 2.31 = 29.51

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000255 FT/MIN

K = .00000130 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00027077 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 2.70 \* 2.31 = 12.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000141 FT/MIN

K = .00000072 CM/SEC

#### PACKER TEST ANALYSIS

WELL NO. 16-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/27/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 52.43 - 62.43

MATERIAL TESTED: ARAPAHOE SILTSTONE

DEPTH TO WATER (FEET BELOW G.S.): 5.09

1ST P1/3 TEST

Q = INJECTION RATE = .00009269 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 3.80 \* 2.31 = 15.19

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000040 FT/MIN

K = .00000020 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00230638 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 15.00 \* 2.31 = 41.06

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000370 FT/MIN

K = .00000188 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014215 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 5.09 + 1.32 + 4.00 \* 2.31 = 15.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000060 FT/MIN

K = .00000030 CM/SEC

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1686	09/02/86	5864.74	5866.60	1.86	45.06	12.66	5853.94
	09/03/86					38.94	5827.66
	09/04/86					34.75	5831.85
	09/05/86					34.04	5832.56
	09/06/86					36.26	5830.34
	09/08/86					29.50	5837.10
	09/09/86					37.92	5828.68
	09/10/86					37.80	5828.80
	09/11/86					37.34	5829.26
	09/12/86					39.14	5827.46
	09/13/86					39.23	5827.37
	09/13/86					45.35	5821.25
	09/18/86					30.71	5835.89
	10/13/86					7.19	5859.41
	11/26/86					5.68	5860.92
	01/01/87					5.04	5861.56
	02/01/87					5.15	5861.45
	04/01/87					5.10	5861.50
	05/06/87					9.79	5856.81
	06/01/87					5.81	5860.79
	07/08/87					6.40	5860.20
	08/06/87					6.60	5860.00
	09/01/87					6.80	5859.80
	09/28/87					6.40	5860.20
	11/03/87					6.00	5860.60
	12/08/87					5.50	5861.10
	01/07/88					5.30	5861.30
	02/04/88					5.20	5861.40
	03/14/88					5.30	5861.30
	04/11/88					5.60	5861.00

SATURATED THICKNESS IN WELL # 16-86(SP) Apr-88 甲中 Jan-88 Oct-87 Jul-87 Apr-87 DATE Jan-87 Oct-86 G Jul-86 Apr-86 Jan-86 20 <del>|</del> O 90 80 60 **2**0 404 9 0 100 20

SATURATED THICKNESS (ft.)

#### INDEX OF DATA

Boring No.: 17-86								
Completed as well? Yes								
Data in File								
X Log of Borehole								
X Well Construction Summaries								
Well Development Summaries								
X Hydraulic Conductivity Test Data and Results								
Packer Test Data and Results								
X Water Level Data								
X Saturated Thickness Hydrographs								

Project:

Rocky Flats Plant

## LOG OF BORING NO. 17-86

Date Drilled 8/14/86

Boring Method ' Hollow Stem Auger

Coordinates N 38752.3 E 22141.7 Ground Surface Elevation

	ng Method	12110	w Stem Auger Gibbin Gu	Penetration	Water	Othor
Elev.	Depth San	rote Gracinic	Material Description	Resistance	Content	Other Tests
(feet)	(feet) Ty	pe Log	Material Description	(Blows/Inch) 20 40	20 40	
		/		20 40	1111	
	0 1		VALLEY FILL ALLUVIUM	' ' ' '	' ' ' ' -	
		0:0	0-0.5'-Sample.		_	
		<b>∕</b> ₹0;.5	Recovered 0.5/0.5'=100%.			
	I <b>1</b> /	/ <b>!</b> e.c	CLAY: grayish orange (10YR 7/4); silty and			
	I <b>-</b> {/	10000	sandy; trace granitic			1
	I -{/	/ Dyo	pebbles (subangular);		_	
	l -1/	1000	poorly sorted;   unconsolidated; dry.	1	_	1
		60.	unconsortuated, dry.	ł	-	ł
	$\mathbf{I}$	10.00	0.5-5.0'-Sample.	1	$\nabla$ -	1
	I 7/	1.0.0	Recovered 3.5/4.5'=88%.		<b>-</b> <u>∨</u> -	i
	1	/ eo.o.	GRAVEL: dusky yellowish brown (10YR 2/2); granitic			
	<b>├</b> ─5 <i>─</i> <b>/</b> /	/ /0.03	pebbles and cobbles	1		1
	<i>-\</i> {/	100	interbedded with silty	1	-	1
	_ <i> </i> /	B00.0	clay stringers; approximately 3% iron		-	1
	$oldsymbol{ u}$	1000	staining in gravel	1	l -	4
	1 7/	10.00	stringers; poorly sorted;	1	l -	1
	1 T/	000	unconsolidated; damp.	I	_	1
	1 <b>-</b> 1/	/ BOD	5.0-8.0'-Sample.			
	I -{/		Recovered 3.0/3.0'=100%.		1	1
	1 1	20.0.	GRAVEL: dark yellowish brown (10YR 4/2);		-	1
	<i> </i>	17000	interbedded granitic		-	1
		/ 0°0:	pebbles, sand, silt and	1	-	4
	I 7/	/ 200	clay; poorly sorted; subangular; wet.			1
	10 -1/	12.0	Subangular; wet.			1
Ī	1 1	1.00	8.0-13.0'-Sample.		Ī	1 .
1	1 <del>-</del> 1	//6000	Recovered 2.0/5.0'=40%. 8.0-12.5'. GRAVEL: dark	İ	•	7
	1 1	/ 600	yellowish brown (10YR 4/2)		-	1
	1 4		and dark yellowish orange		-	4
•		0.0.	(10YR 6/6) granitic			4
		//	pebbles and cobbles; sandy and silty; poorly sorted;	I	1	4
-	1 7/	/ /	unconsolidated; wet.	J		1
	1 1	//	ARAPAHOE FORMATION			1
I	1 <b>-</b> 1	//	12.5-13.0'. CLAYSTONE.	1	1	
ı	1 1	//	<b>d</b>		1	1
•	15	//	13.0-16.0'-Sample.	1	•	1
l	1 1		Recovered 2.8/3.0'=93%. CLAYSTONE: Dusky			-1
1		//	yellowish brown (10YR 2/2)	1	1	-1
	1 7		and dark yellowish orange			4
	1 1	//====	<pre>- (10YR 6/6); silty; - consolidated; weathered;</pre>			
	1 1	/ /===	moist.	1		
	1 -1	//	16.0-19.2'- Sample.	I	1	
1	<b>I</b>		Recovered 1.8/3.2'=56%.		1	
	1 1	<b>//</b> [EEE	CLAYSTONE: dark yellowish	ı	1	1
		/ /	<pre>brown (10YR 4/2); 10% iron staining; consolidated;</pre>	1	1	-1
1			moist.		i	4
	20		TOTAL DEPTH: 19.2'			
Res	narks	Logged by	: L. Pivonka	Chec	ked by:	

Remarks.

Project No. 106P06222

Hydro-Search, Inc.

Page 1 of 1

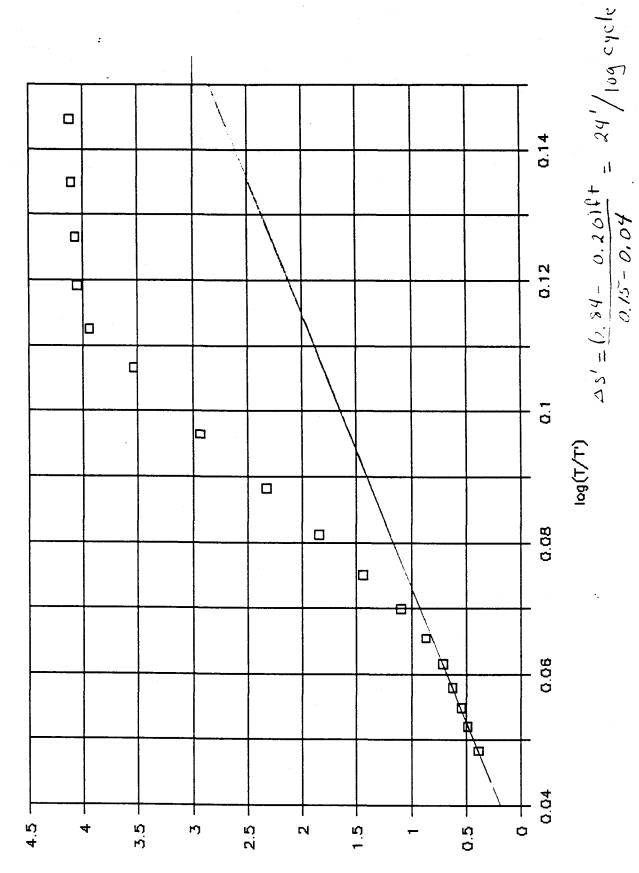
					Pà	WELL CONSTR	UCTION S	UMM	ARY		•
	1			2		LOCATION or COORDS:	ELEVATION: GROUP	ND LEVEL	586	55.26'	
					66	N 38752.3 E 22141.7	TOP O	F CASING	s <u>58</u> 6	66.55'	<del></del>
ı	ıŀ	_ 5			ic.	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
				I	K.	TOTAL DEPTH Well: 13.98' Hole: 19.20'		<u>\$17</u>	ART	FIN	ISH
					00	BOREHOLE DIAMETER 74"	TASK	<b>DATE</b> 1986	IIME	<u>DATE</u> 1986	TIME
		-10			100	DRILLER Boyles Brothers Drilling Co. 15865 W. 5th Avenue	DRILLING: 건네 auger	8/14_	.0931_	8/18	1020
					19	Golden, CO (Jim Horn)					
	П				₽.						
- (				∥≣	٤	D 11	GEOPHYS. LOGGING:	<del></del>			
8 2	!				=	BIT(S) Bull nose bit	CASING: 2" stainless	8/15	_1037	8/15	1040
Golden, CO		-15				DRILLING FLUID None	2 Statifiess				
এ -						SURFACE CASING 5" x 5' steel w/ locking	FILTER PLACEMENT	8/15	1040	8/15	1056
	!					-	CEMENTING:	8/15	1100	8/15	1110
2 2		_20	<u> </u>		 -	WELL DESIGN:	CEVELOPMENT:	9/2	1550	9/22	0920
LOCATION _	5					BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
CA						CASING STRING(S): C=CASING S=SCREEN	Bentonite	8/15	1058	8/15	1100
ב ב	-					0.00' 3.73' Cl		8/15	1025	8/15	1040
						_3.73'- 13.98' S1					
		-25									
	.	۷.	,		}	l			<b></b>		
PROJECT 106P06222	1 1 1 1 1 1 1	- 34 - 4	·0			CASING: CI 2" I.D. Sch. 5 type 316 stain- less steel threaded and flush jointed.  SCREEN: SI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush jointed, 0.010" wire wrapped screen, 0.25' welded bottom cap.  CENTRALIZERS Type 304 stainless steel 7.97' - 9.09'  FILTER MATERIAL 10-20 silica sand 2.50' - 14.00'  CEMENT Portland Type I 0.00' - 2.00'  OTHER 3/8" bentonite pellets 2.00' - 2.50' 14.00' - 15.25'	See Well Deve	ered at	4.8' du	ring dri	lling.
		- 5	0			HYDRO-SEARCH RENO-DENVER	CONSULTING F	HYDROL	OGISTS	GEOL	OGISTS



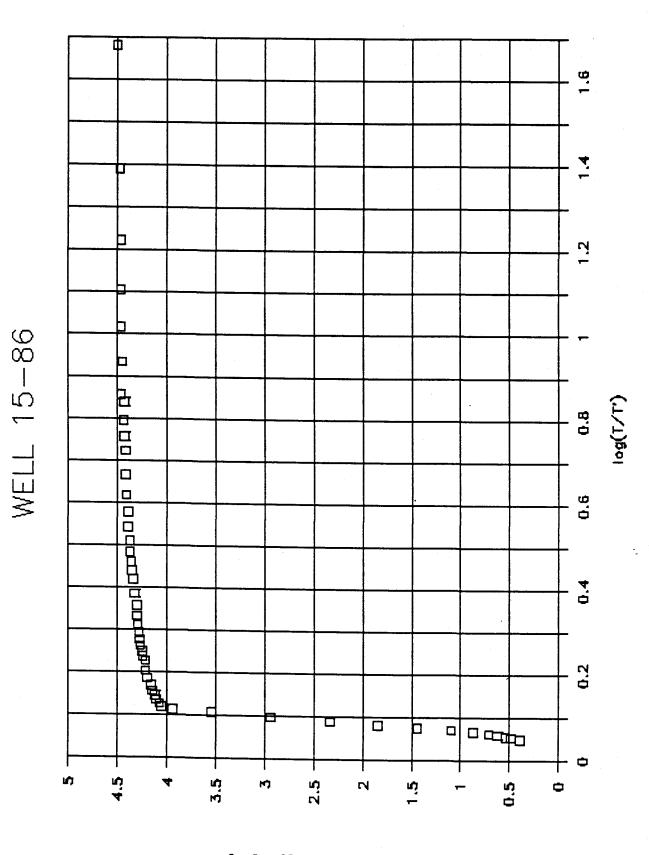
CLIENT/SUBJECT			W.O. NO	
TASK DESCRIPTION			TAS	SK NO
PREPARED BY	DEPT	DATE	AF	PROVED BY
MATH CHECK BY	DEPT	DATE		
METHOD REV. BY	DEPT	DATE	DEPT	DATE
Hydraulic	WELL Conductive	17-86	(a) = 4.8 x	/o <sup>-6</sup>
	later Level			en en en en en en en en en en en en en e
Screened	Interval	(ft below	G, L,)= 3,	73 - 13,981
3,	73- 12,5'	gravel		
12	15 - 13,98'	claystone		
				and the second s
				An advance of the second
Method o	of Analysis	: (Bouw	er, 1978	
			•• •	
				and the second s
			***	

RFW 10-05-003/A-5/85

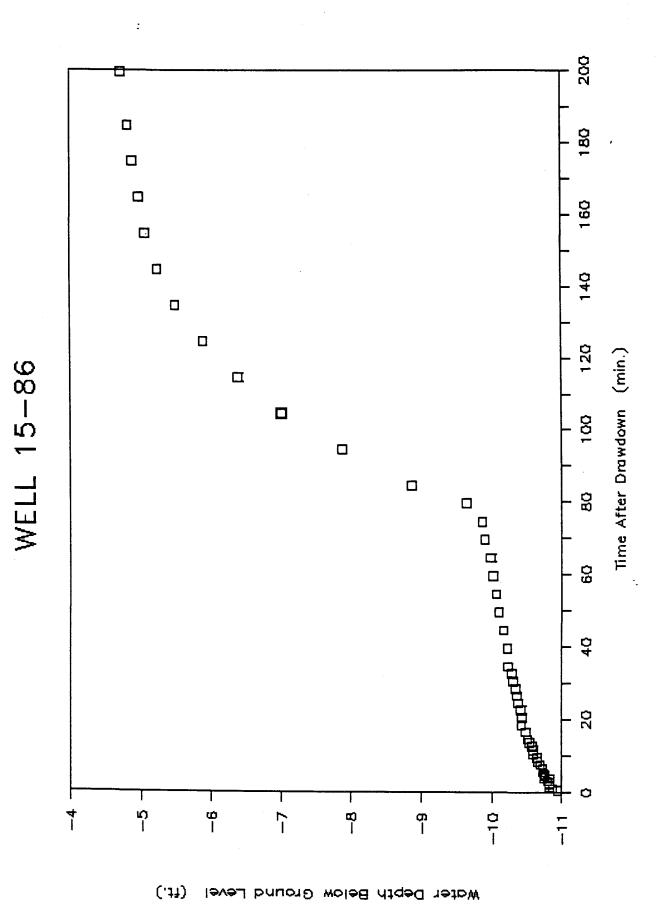
WELL 15-86



('11') ((A\*S)\Z^2)-s



s-{s\_5\{S\*b}) {\time{\$\pi\$}}



_		•	WELL 15-8		
T.	_ T'.	Water	s'	$s-(s^2/2b)$	log(T/T')
Time	T Prime	Level		b=10.36 ft.	
(min.)	(min.)	(ft.)	(ft.)	(ft.)	
24.00	0.50	10.94	6.61	4.50	1.68
24.50	1.00	10.87	6.54		1.39
25.00	1.50	10.82	6.49		1.22
25.50	2.00	10.82	6.49		1.11
26.00	2.50	10.82	6.49		1.02
26.60	3.10	10.80	6.47		0.93
27.30	3.80	10.82	6.49		0.86
27.50	4.00	10.75	6.42		0.84
28.00	4.50	10.76			0.79
28.50	5.00	10.74			0.76
29.00	5.50	10.72	6.39		0.72
30.00	6.50	10.72	6.39		0.66
31.00	7.50	10.69	6.36		0.62
32.00	8.50	10.65	6.32		0.58
33.00	9.50	10.64	6.31		0.54
34.00	10.50	10.59	6.26		0.51
35.00	11.50	10.59		4.37	0.48
36.00	12.50	10.57	6.24		0.46
37.00	13.50	10.54	6.21		0.44
38.00	14.50	10.51	6.18		0.42
40.00	16.50	10.48	6.15		0.38
42.00	18.50	10.42	6.09		0.36
44.00	20.50	10.43			0.33
46.00	22.50	10.41	6.08		0.31
48.00	24.50	10.37			0.29
50.00	26.50	10.36	6.03		0.28
52.00	28.50	10.34	6.01		0.26
54.00	30.50	10.30			0.25
56.00	32.50	10.28			0.24
58.00	34.50	10.23			0.23
63.00	39.50	10.22			0.20
68.00	44.50	10.17			0.18
73.00	49.50	10.09			0.17
78.00	54.50	10.06	5.73		0.16
83.00	59.50	10.01	5.68		0.14
88.00	64.50	9.98			0.13
93.00	69.50	9.90			0.13
98.00	74.50	9.86	5.53		0.12
103.00	79.50	9.63	5.30		0.11
108.00	84.50	8.86			0.11
118.00	94.50	7.87			0.10
128.00	104.50	7.01			0.09
138.00	114.50	6.38	2.05	1.85	0.08

			WELL 15-80	5	
T	T'	Water	s'	$s-(s^2/2b)$	log(T/T')
Time	T Prime	Level	Rsd Drwdn	b=10.36 ft.	
(min.)	(min.)	(ft.)	(ft.)	(ft.)	
148.00	124.50	5.89	1.56	1.44	0.08
158.00	134.50	5.49	1.16	1.10	0.07
168.00	144.50	5.24	0.91	0.87	0.07
178.00	154.50	5.07	0.74	0.71	0.06
188.00	164.50	4.98	0.65	0.63	0.06
198.00	174.50	4.89	0.56	0.54	0.05
208.00	184.50	4.83	0.50	0.49	0.05
223.00	199.50	4.73	0.40	0.39	0.05

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### AQUIFER TEST DATA

PUMPING & OBSERVATION WELL

TYPE OF AQUIFER TEST Constant Sischores	PUMPING or RECOV
HOW Q MEASURED 4 2 00 // bucket	PAGE/ OF
HOW W.L.'s MEASURED - OLYMPIC well sounder	DEPTH OF PUMP/AIRPIPE
RAD./DIST. OF/FROM PUMPING WELL	PUMP ON: date 9/26/86 time_
MEAS. POINT FOR W.L.'S No side of 3" Pre	PUMP OFF: date 9/26 PG time_
FI EVATION OF MEAS POINT	DURATION OF AQUIFER TEST

	ELEVATION OF MEAS. POINT		DURATION OF AQUI		
	TIME t= at t'=0	WATER LEVEL	DATA 4,33 ft.	DISCHARGE	COMMENTS
	CLOCK t t'	READING CONVERSIONS WATER	s or s'	READ- Q	S COMMENTS
	1 1336 original	5+212 278 434	NIA		T.D = 14.15 ·
1 7	1540 3	5+3.44 1.33+28 4.33			wed = 4,34 -
17	151215005	5+4.19 1.33+278 5.08	0.75		Note. T.D. +
2	1513:10 1	0-0.05 " 5.84	1.51		W.L. taken
٥	15/3:30 1.5	10+0.61 " 4.50	2,17		before PVC pipe
	1514:00 2	10+1,27 " 7.16	2.83		insert al down-
Heist	24:30 29	10+1.93 " 7.82	3 49		hole.
W. Her:	15/5:40 3	101257 " 8.46	4,13		
-	157500 3.5	10+3.07 " 8.96	4.63		
5	1576. 4	10+3.57 9.46	5.13		
با	1516.46 +3		_	4 0.93	7 29/
PERSONNEL	1517 5	10+421 10.10	. 5,77	,	
SO	1517:30 55	10,12	< 79		1.33 - PVC shill
3 3	1518:00 6	10.01	5.68		2.78 = innercasi
-	1518:30 6.5	10+4.21 1 10.10	5.77		Shuk-u
	1519 7	10-4.26 " 10.15	5.82		
	1514:30 7.5	10++28 11 10,17	5.84		
1 1	1520: 8	10+4.28 10.17	5,24		'
	1521 9	D+1.41 1 10.30	5.97	4 0.850	490/
	1500 10,0	10+4.13 10,32	5.99	1 1	/
	// 562/	10+4.49 10.38	6.05		
1	12/ 12	10+4.51 11 10,40	6.07		
	13	10+4.59 12.78	6.15 15:25	1 0.08	an .
1 1	1526 14	10+4,0 " 10.51	6,18	),	1
3	1527 15	10+475 10.64	6.31		
13	1528 16	10+4.79 1 10.68	6,35		
C224	1529 17	10-7.89 11 10.78	6.45 10:29:3	1 4 /gpr	4
907	1530 18	10.87	6.54	J	1/15:35:17,4.34
1	150 20	15+0.16 " 11.05	6.72		+ W.L & 15 + 0.
	15:34 22	1510.28 11 11.17	6. 24		Pump off @
1	15125 117 23 3		7.09 5:35:1		15:35:30 Ne
	15:36 .4 0		-6.61	1 //	resona at 151%
5	15:36 30 275 25		-16.54		bogn recharge
FROJECT	15:37 25 /	10+4.93 11 10.83	-6.49		
ž	15:31 Br 255 1.5		-6.49	1	
	15:58! 36 2	11497 11 10.82	-6,49	<del>                                     </del>	
	15 34 340 06 26	10+4,91 11 10.80	-6.47		
	15 37.15 37.25 3.25		-6.49		
	039,30 27.5 35		-6.42		
	15:40:00 28 4	10.76	-6.73		
	13:40:30 275 7.5	10+4.05 11 10.74	-2.+1	1 1	

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AQUIFER TEST DAT  TYPE OF AQUIFER TEST CONSTANT DISCLORER.  HOW Q MEASURED TE CONTROL OUCKET  HOW W. L'S MEASURED OLYMPIC WELL SOUNDER	PUMPING or C	PUMPING OF OBSERVATION WELL PUMPING OF RECOVERY DATA PAGE 2 OF		
RAD./DIST. OF/FROM PUMPING WELL		ime		
MEAS. POINT FOR W.L.'s N. side of 1 4 PVC	PUMP OFF: date	ime		
ELEVATION OF MEAS. POINT	DURATION OF AQUIFER TEST			

		T1.		-		144.5		0.454	1			
TIME t= at t'= o			WATER LEVEL DATE STATIC WATER LEVEL			. DATA	DISCHARGE READ- ING Q		Y Y	2044-5		
D A	CLOCK TIME	t	t'		READING	CONVERSIONS	WATER	s or s'	READ-	Q	RECO	COMMENTS
5	4/100	29	5		10+4.83	1.3777	10.72	-6.39		·	WH	
,	42:00	30	6			1,33+2,78					1	
	13'00	3/	7		10+4.80		10,69	1 1 1				
	#10	32	8		10++.76		10,65				$\vdash$	
	45:00	33	9		10+1.7		10.64	-6.31			1	94
_	76	34	10		10+470		10.59	-6.26			<del></del>	90% le 4 215.
	47	35	11		10+4.70		10,59				00	
	48	36	12		10+4.68			I			-	
_	49	<i>2</i> 7	13		10+4.65		10.57	-6.24			<del>                                     </del>	
	70	ر مراس	14		1		10.54	-6,21			<del>                                     </del>	
$\rightarrow$	:52	~g	16		10+4.62		10.51	-6.18	_		4	
_		~ <u>~</u>	<i>ي.</i> حرز		10+4.59		10.48				4_	
Т	1554				N+4.53	, ,	10.72	-6.09			<del> </del>	
- 1	1556	44	> O		10+4.54			-6.10			1	
┥	558	46	~~		10+4.52	• •	10,41				ص	
-	1600	48	J#		10+4.48			-6.04			ω	
+	1402	50	26		10+4,47	11	10,36	-6.03			13#	
4	1604	52	28		10+4,45	11	10,34	-6.01			4 م:	
4	1606	54	30		10+4,41	1 *	10,30	-5.97			۾ 'نيز	
4	1608	56	<i>ॼ</i>		10+4.39	7.4	10.28	-5.95			MH	
4	1610	27	34		10+4.34	,	10, 23	-5,90			De	
$\perp$	1615	.:3	39		10+4.33		10,22				1	
	1620	シン	44		10 14.28		10.17	- 5,84			+	
	1625	72	49		10+4.20		10,09	-776	1		00	<del></del>
	1630	77.4	54		10+4.17		10.06	-5,73			DP	
T	635	وتع	59		10+4.12		10.01	-5,68	7		DP	
	1640	33	64		10+4.09		2.98	-5.65			OP	
_	645	93	69		10+4.01			-5,57				
Т	1650	98	74		1013.97			-5.53			00	
_	1655	103	19		10+3.74	7.	7.63				90	
	1700	1-2	24		10+2.47	11					00	
7	1710	ر الأورار	74		10+1.98	7,	7.87	-4.53			al	
	1720	186	104			<del></del>		-3 54			De	
	1730	1382	114		10 + 1.12 10 + 0AA	- ''		-2.68			DP	
Т		148				,,		-2.05			00	<del></del>
- 1	1946		124		10+0.0		5.89	-1.56			2	
-1-	750	152	134		5+4.60		5.49				00	
-	1800	72	144		5+4.35		5,24	-0.91		/	WH)	
$\overline{}$	1810	172	154		5+4.18		507	-0.74			op)	
- 1	1820	127	164		5+4.09	* /	4.98	- ع د . د -			00	90% Recovere
	1830	198	174		5+4.00		489	-0.56			UH	
	1840	200	184		5+3.94		4.83				W4	
- 1	1155	233	199		5+384	11	4.73	-0,40			OP	

LOCATION (

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# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1586	09/04/86	5845.61	5847.93	2.32	14.69	7.05	5840.88
	09/05/86					7.17	5840.76
	09/06/86					7.05	5840.88
	09/08/86					6.67	5841.26
	10/13/86					6.60	5841.33
	11/26/86					6.89	5841.04
	01/01/87					6.67	5841.26
	02/01/87					6.40	5841.53
	04/01/87					4.96	5842.97
	05/06/87					5.44	5842.49
	06/01/87					6.71	5841.22
	07/08/87					6.70	5841.23
	08/04/87					7.10	5840.83
	08/05/87					7.00	5840.93
	09/01/87					6.80	5841.13
	09/28/87					7.10	5840.83
	11/03/87					6.80	5841.13
	12/08/87					6.70	5841.23
	01/07/88					6.70	5841.23
	02/04/88					6.70	5841.23
	03/14/88					6.60	5841.33
	04/11/88					6.70	5841.23

SATURATED THICKNESS IN WELL # 15-86(SP) Apr-88 9 Jan-88 Oct-87 Jul-87 Apr-87 DATE Jan-87 Oct-86 Jul-86 Apr-86. Jan-86 20 T 8 Ö Ó 100 90 80 2 60 50 <del>4</del>

SATURATED THICKNESS (ft.)

### INDEX OF DATA

Boring No.: 16-86
Completed as well? Yes
Data in File
X Log of Borehole
X Well Construction Summaries
Well Development Summaries
X Hydraulic Conductivity Test Data and Results
X Packer Test Data and Results
X Water Level Data
X Saturated Thickness Hydrographs

LOG OF BORING NO. Project: Rocky Flats Plant 8/15/85; 8/25/86 Date Drilled Coordinates N 38759.9 E 22159.7 Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5864.74 Penetration Resistance Other Tests Elev. Depth Sample Graphic (feet) (feet) Type Log Material Description (Blows/inch) 20 40 VALLEY FILL ALLUVIUM 0-0.4'-Sample. Recovered 0.4/0.4'=100%. GRAVEL: dark yellowish orange (10YR 6/6) sandy, silty, and clayey; subangular grains of feldspar and quartz; poorly sorted; unconsolidated; dry. 0.4-5.0'-Sample. Recovered 4.0/4.6!=87%. CLAY: dusky yellowish brown (10YR 2/2) silty 6000 clay; some quartzite 200 pebbles and cobbles; poorly sorted; subangular to subrounded gravel; unconsolidated; dry to damp. 5.0-6.5'-Sample. Recovered 1.5/1.5'=100%. GRAVEL: dark yellowish brown (10YR 4/2) sandy, silty and clayey; granitic pebbles; poorly sorted; unconsolidated; moist. 6.5-7.0'-Sample. Recovered 1.5/1.5'=100%. CLAY: dark yellowish brown (10YR 4/2); silty; trace iron staining; unconsolidated; damp. ARAPAHOE FORMATION 7.0-10.5'-Sample. Recovered 3.5/3.5'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty
trace iron staining; laminated; weathered; dry. 10.5-13.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty; trace iron staining; laminated; weathered; dry. 13.0-18.0'-Sample. Recovered 4.0/5.0'=80%. CLAYSTONE: dark yellowish brown (10YR 4/2); silty; iron stained; laminated; weathered; dry.

Remarks

Logged by: L. Pivonka & T. Gulliver

Checked by:

Project No.

106P06222

Hydro-Search, Inc.

Page 1 of 4

Rocky Flats Plant

### LOG OF BORING NO.

16-86

Date Drilled -

8/15/86; 8/25/86

Coordinates N 38759.9 E 22159.7 Ground Surface Elevation 5864.74

Bori	ng Meti	nod	Hollow S	Stem Auger/NC Core Ground Sur	face Elevation	on 5864.74	
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	20			18.0-23.0'-Sample. Recovered 4.3/5.0'=86t. CLAYSTONE: medium gray (N 5); silty; laminated; unweathered; dry.	1 1 1 1	-    -	
	-    -			23.0-26.0'-Sample. Recovered 3.0/3.0'=100%. CLAYSTONE: medium gray (N 5); silty; trace iron			
	25			staining; laminated; dry.  26.0-28.1'-Sample.  Recovered 2.1/2.1=100%.  RQD 1.9/2.1'=90%.		:	
	-			CLAYSTONE: medium gray (N 4); carbonaceous laminae; some limonitic partings; damp.			1
	-			28.1-32.8'-Sample. Recovered 4.7/4.7'=100%. RQD 4.7/4.7'=100%. CLAYSTONE: medium gray (N 4); carbonaceous laminae;			
	30 <b></b>			some limonitic partings; damp.			
	-			32.8-34.0'-Sample. Recovered 1.2/1.2'=100%. RQD 1.2/1.2'=100%. CLAYSTONE: Same as above:			-
-				damp.  34.0-39.0'-Sample.  Recovered 3.8/5.0'=76%.  RQD 3.4/3.8'=90%.			† †
	35 -	1		34.0-35.2'. Lost core.  35.2-37.0'. CLAYSTONE: medium gray (N 4);			
		1		carbonaceous laminae; some limonitic partings; damp.  37.0-39.0'. CLAYSTONE: Same as above; damp.			<del>-</del> -
		1		39.0-44.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%.			
86	40	1	Loca	39.0-40.1'. CLAYSTONE: Same as above; damp.  ed by: L. Pivonka & T. Gulliver	سيا	Checked b	by: ddR

Project No. 106P06222 Hydro-Search, Inc.

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Rocky Flats Plant

### LOG OF BORING NO.

6-86

Date Drilled

8/15/86; 8/25/86

Boring Method Hollow Stem Auger/NC Core

Coordinates N 38759.9 E 22159.7 Ground Surface Elevation 5864.74

Elev. (feet)	Depth Semp (feet) Typ	la Graphic e Log		Penetration Resistance (Blows/Inch) 20 40	Water Containt 20 40	Other Tests
	40		40.1-41.4'. SILTSTONE: medium gray (N 4);			
	1		laminated; well sorted; damp.			
	4-		41.4-41.9'. SILTSTONE: dark gray (N 3);		_	
			laminated; well sorted; damp.		-	
	4		41.9-43.8'. SANDSTONE:		-	
	1		<pre>medium gray (N 5); very fine-grained; massive;</pre>			
}	<u> 45</u>		some carbonaceous detritus; damp.		_	
l	1_		43.8-44.0'. SILTSTONE: dark gray (N 3); clayey;		1	
.		蘿	laminated; damp.			
	1		44.0-49.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.5/5.0'=90%.		· —	
			44.0-44.8'. SILTSTONE:			
	7	<b>医量</b> 基	dark gray (N 3); clayey; evenly laminated; damp.		-	
	_50		44.8-49.0'. CLAYSTONE: dark gray (N 3);		1	
	4		laminated; damp.		-	
•	1		49.0-54.0'-Sample. Recovered 5.0/5.0'=100%.			
ı	+		RQD 4.4/5.0'=88%.		-	
l	1		dark gray (N 3); slightly calcareous; laminated;			
-			damp.		-	
	4		49.6-51.2'. CLAYSTONE: grayish black (N 2); silty; damp.		-	
ŀ	- 55		51.2-52.3'. SILTSTONE:	1		
	4		grayish black (N 2); clayey; laminated; damp.		-	
	1_		52.3-54.0'. SILTSTONE:			
	4		<pre>dark gray (N 3); some very fine-grained sand (light gray (N 7)); convolute</pre>		-	
	1		bedding; damp to moist.			
	+		54.0-59.0'-Sample. Recovered 1.3/5.0'=26%.		4	
	60	建	RQD 0/1.3'=0%.			
Rema	rks	Logged b	oy: L. Pivonka & T. Gulliver		Checked by:	THE WAR

Project No.

106P06222

Hydro-Search, Inc.

Page 3 of 4

LOG OF BORING NO. Project: Rocky Flats Plant 16-86 Coordinates N 38759.9 E 22159.7 **Date Drilled** 8/15/86; 8/25/86 Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5864.74 Penetration Resistance Other Tests Depth Sample Graphic (feet) Type Log Elev. Material Description (Blows/Inch) 20 40 20 54.0-54.51. CLAYSTONE: medium dark gray (N 4); massive; damp. 54.5-59.0'. SILTSTONE: dark gray (N 3) and very fine-grained light gray (N 7) sandstone; even interlaminated; damp. 59.0-64.0'-Sample. Recovered 5.0/5.0'=100%. RQD 2.5/5.0'=50%. 59.2-60.7'. SILTSTONE: medium gray (N 5); clayey; laminated; damp. 60.7-61.4'. CLAYSTONE: grayish black (N 2); laminated; damp. 61.4-64.0'. CLAYSTONE: medium gray (N 5); silty; laminated; damp. TOTAL DEPTH: 64.0' Logged by: L. Pivonka & T. Gulliver Remarks Checked by: Project No. 106P06222 Hydro-Search, Inc. Page 4 of 4

WELL	16-86	

WELL CONSTRUCTION SUMMARY 5864.741 LOCATION or COORDS: . ELEVATION: GROUND LEVEL -N 38759.9 E 22159.7 5866.60' TOP OF CASING . DRILLING SUMMARY: CONSTRUCTION TIME LOG: START FINISH TOTAL DEPTH Well: 45.06' Hole: 64.00' TASK BOREHOLE DIAMETER 0.00' - 26.00': 74" DATE 1986 DATE TIME TIME 26.00'-45.00': 4 3/4" 45.00'-64.00': 3 7/8" 1986 DRILLING: 8/15 1530 7片" auger 8/15 1330 DRILLER Boyles Brothers Drilling Co. 8/25 1200 15865 W. 5th Avenue, Golden, CO NC core 8/25 0920 8/27 1725 1700 Jim Horne, Paul Wiebe Reaming 8/27 RIG 0.00'-26.00' Mobile B57, 26.00'-64.00' GEOPHYS. LOGGING: BIT(S) 0.00'-26.00' Blade bit Failing 1500 Pivonka/T. CASING: 8/18 8/18 26.00'-64.00' Christensen carbide, tricone 5" steel 0907 1110 ORILLING FLUID 0.00'-26.00' None 1014 2" stainless 8/28 1012 8/28 26.00'-64.00' air/water mist 8/28 1018 8/28 1030 SURFACE CASING 5" x 28.55' steel w/ lock-FILTER PLACEMENT 8/28 8/28 1130 1135 CEMENTING: PERSONNEL WELL DESIGN: 1725 9/18 9/2 1240 LEVELOPMENT: LOCATION BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG OTHER: 8/28 1040 8/28 1041 Bentonite CASING STRING(S): C=CASING S=SCREEN 0945 0948 8/28 8/28 0.00' 26.00' C1 0.00' - 39.06' Packer testing Cementing 5" steel 8/27 1645 C28/27 0900 39.06' - 45.06' S1 8/18 0918 8/18 0938 WELL DEVELOPMENT See Well Development Summary Sheet. CASING: CI 5" I.D. steel surface casing c2 2" I.D., Sch. 5, Type 316 stainless steel, threaded and flush jointed SCREEN: SI 2" I.D., Sch. 5, Type 316 stain-**\_-**70 Ы less steel, threaded and flush Rocky Flats COMMENTS: jointed, 0.010" wire wrap screen 106P06222 0.25' welded bottom cap. No water encountered during drilling. CENTRALIZERS Type 304 stainless steel Top of stainless steel casing: 1.86' 40.49' - 41.73' 80 PROJECT FILTER MATERIAL 32-42 silica sand NC core 26.00' - 64.00' 37.65' - 45.06' Reamed from 26.00' - 45.00' CEMENT Portland Type I 0.00' - 35.25' 90 OTHER 3/8" bentonite pellets 35.25' - 37.65' 45.06' - 47.15' 10-20 silica sand: 47.15' - 64.00'

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SHEET	•	6
SHEET		

CLIENT/SUBJECT			W.O. NO		
TASK DESCRIPTION			TAS	K NO	
PREPARED BY	DEPT	DATE	AP	PROVED BY	
MATH CHECK BY	DEPT	DATE			
METHOD REV. BY	DEPT	DATE	DEPT	DATE	
	WE	16-86			

Hydraulic Conductivity (cm/sec) = 6×10-8

Flowrate (apm) = 0,5 gpm

Screenes Interval (It below G.L.) = 39.06-45.36

39,06-40.1 claystone

40.1- 41.9 siitstone

41.9- 43.8 sand stone

43.8 - 44.3 siltstone

42.2 - 1503 claystone

Method of Analysis Residual - drawdown Plot (Driscoll, 1926 - pg 256.)

SH	EET	 of	

CLIENT/SUBJECT			W.O. NO			
TASK DESCRIPTION			TASK NO			
PREPARED BY	DEPT	_ DATE	APPROVED BY			
MATH CHECK BY	DEPT	_ DATE				
METHOD REV. BY	DEPT	_ DATE	DEPT DATE			

WELL 16-86

$$T \left( \frac{q + d}{f + 1} \right) = \frac{264 Q}{25'} = \frac{(264)(.5)}{17,100} = 7.72 \times 10^{-3}$$

$$K(qpd/ft^2) = 7.72 \times 10^{-3}/6.00 = 1.29 \times 10^{-3}$$

nis method is lated where usoiot

solving for t for us o.ol.

$$\pm .min) = \frac{r = S}{4 + u} = \frac{(0.198) \times 10^{-3}}{(4)(7.72 \times 10^{-3})(.01)} \times \frac{1440 min}{dal} \times \frac{7.482 cal}{64}$$

where 
$$r = (\frac{4.75}{24}) l + = 0.198 l +$$

$$l = 10^{-3} \text{ assumed } S \text{ for infined equipment}$$

$$\Delta S' \text{ is based on points where } t \ge 7551 \text{ min.}$$

RAW DATA

WELL # 17-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .19 GALLONS\*
LENGTH OF AQUIFER TESTED= 9.35 FEET
VALUE OF HO= 1.17 FEET
STATIC WATER LEVEL= 4.63 FEET
LENGTH OF SCREEN= 13.98 FEET
WATER TABLE TO BOTTOM OF WELL= 9.35 FEET

\* Actual volume of water removed not recorded. 0.19 gallons back-SLUG TEST DATA: calculated from first recorded residual drawdown (1.17 ft).

TIME	WATER LEVEL (FEET)	TIME SINCE TEST BEGAN (MINUTES)
14. 7.15 14. 7.30 14. 8. 0 14. 8.30 14. 9. 0 14. 10. 0 14. 11. 0 14. 12. 0 14. 13. 0 14. 14. 0 14. 15. 0 14. 16. 0 14. 17. 0 14. 18. 0 14. 19. 0 14. 20. 0 14. 21. 0 14. 22. 0 14. 23. 0 14. 23. 0 14. 36. 30 14. 40. 0 15. 0. 0 15. 0. 0 15. 20. 0	5.80 5.80 5.80 5.72 5.71 5.661 5.55 5.47 5.44 5.33 5.33 5.33 5.33 5.33 5.33 5.33	42.25 42.50 43.00 43.50 44.00 44.50 45.00 46.00 47.00 48.00 49.00 50.00 51.00 52.00 53.00 54.00 55.00 56.00 57.00 58.00 60.00 65.00 71.50 75.00 85.00 95.00 105.00 115.00
15.30. 0	5.01	125.00

WELL # 17-86

WELL DIAMETER= 7.25 INCHES CASING DIAMETER= 2.00 INCHES VOLUME OF WATER REMOVED OR ADDED TO WELL= .19 GALLONS LENGTH OF AQUIFER TESTED= 9.35 FEET VALUE OF HO= 1.17 FEET STATIC WATER LEVEL= 4.63 FEET

#### SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIM (1/MINUTES)
42.25	5.80	1.17	1.000	.024
42.50	5.80	1.17	1.000	.024
43.00	5.80	1.17	1.000	.023
43.50	5.78	1.15	. 983	.023
44.00	5.72	1.09	.932	.023
44.50	5.71	1.08	. 923	.022
45.00	5.70	1.07	.915	.022
46.00	5.65	1.02	.872	.022
47.00	5.61	.98	. 838	.021
48.00	5.58	.95	.812	.021
49.00	5.53	. 90	.769	.020
50.00	5.50	.87	.744	.020
51.00	5.48	.85	.726	.020
52.00	5.47	.84	.718	.019
53.00	5.44	.81	.692	.019
54.00	5.39	.76	.650	.019
55.00	5.39	.76	.650	.018
56.00	5.39	. 76	.650	.018
57.00	5.39	.76	.650	.018
58.00	5.38	.75	.641	.017
60.00	5.38	.75	.641	.017
65.00	5.28	.65	. 556	.015
71.50	5.21	. 58	. 496	.014
75.00	5.22	.59	. 504	.013
85.00	5.12	. 49	.419	.012
95.00	5.10	. 47	. 402	.011
105.00	5.01	. 38	. 325	.010
115.00	5.01	.38	. 325	.009
125.00	5.01	. 38	. 325	.008

WELL # 17-86

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=3.77E-04/ MATCH TIME (IN MINUTES) STORAGE COEF= 7.61E-02\* ALPHA COMPUTER CALCULATES ALPHA=1.00E-05 MATCH TIME= 5.43E+01 PERMEABILITY= 6.95E-06 CM/SEC STORAGE COEF=7.61E-07 CORRELATION NUMBER= .99

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=6.48E-04 / LAG TIME BOUWER PERMEABILTY=7.66E-04 \* -SLOPE

COMPUTER CALCULATES

--------------

HVORSLEV PERMEABILITY=6.47E-06 CM/SEC BOUWER PERMEABILITY=4.75E-06 CM/SEC REGRESSION STATISTICS

> X ON Y INTERCEPT= .17 SLOPE=-5.98E-03 Y ON X

INTERCEPT= .20 SLOPE=-6.42E-03

CORRELATION COEFFICIENT= -.97

CALCULATIONS INDICATE THAT A VALUE OF 5.03 FEET FOR HO OR A VALUE OF .964 INCHES FOR EFFECTIVE CASING DIA. MAY YIELD BETTER RESULTS

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES MET

PERMEABILITY=1.10E-04 / SLOPE PERMEABILITY=2.07E-06 CM/SEC REGRESSION STATISTICS

X ON Y INTERCEPT= -.12 SLOPE= 5.20E+01 Y ON X INTERCEPT= -.15

SLOPE= 5.39E+01 CORRELATION COEFFICIENT= .98

WELL #	PERMEABILITY METHOD 1	PERMEABILITY METHOD 2	STORAGE COEF METHOD 2	PERMEABILITY METHOD 3	PERMEABILI METHOD 4
17-86	6.47E-06	6.95E-06	7.61E-07	2.07E-06	4.75E-06

<sup>\*</sup> METHOD 1 IS HVORSLEV

METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD 3 IS FERRIS AND KNOWLES

METHOD 4 IS BOUWER

101UEED TEOT D	WELL 17-86
AQUIFER IEST DA	PUMPING OF OBSERVATION WELL
TYPE OF AQUIFER TEST BACOVERY TEST	PUMPING OF RECOVERY BATA
HOW Q MEASURED TOLA	PAGE OF
HOW W.L.'S MEASURED	DEPTH OF PUMP/AIRPIPE
RAD./DIST. OF/FROM PUMPING WELL /	PUMP ON: date <u>11-19-86</u> time
MEAS. POINT FOR W.L.'s	PUMP OFF: date 11-19-26 time
FI EVATION OF MEAS POINT	DURATION OF AQUIFER TEST

	EL	EVATION	OF MEA	S. POI	TV	WATER LEVEL DATA STATIC WATER LEVEL 5+1.32 (NOT NOT)  READING CONVERSIONS WATER LEVEL S OF S' READING CORRECTIONS LEVEL S OF S' ING Q								
		t=_	TIM	E at t	· = o	STATIC	WATER L	R LEVEL	DATA 5+1.32 (~	or AU)	DISCH	IARGE	PROED	COMMENTS
	0	CLOCK		<b>t</b> '		READING	CONVERSIONS	WATER	s or s'		READ-	q	REC	1.69
	7	11					1.69						16	
	17	B:25											/	STARTED LIFTING
	17	1355												STOPPED HETTING
		1404												STOP CIFTING
												CLAS	215	CONTINUALS 5 MIN
	Г	1405:3				5+.87	)							96% 6.43=54
		1406					77 5106	WALL WI	TER ?				19	
		1406:3				+1.84		, .						
		140715	ao			+2.4	1.69	5.80	1.17					
		1407:50	.5-			12.49	1.67	5.50	1.17					
ہا	Г	1408	1.0			2.49		7.30	1.17					
NON		1408:3	1.5			2.47		5.19	1.15					
ATI		1409	2.0			2.41		5.72	1.09					
LOCATION PERSONNEL		1409:30	2.5			2.40		5.71	1.00	,				
. –	Г	1410	3,0	,	\$	2.39		5.70	1.07					
A		1411	4		112	2.34		5.65	1.02					
		1412	5			2.30		5.61	0.98					
1 1	Г	1413	6		-	2.27		2.58	0.95				,	
		1414.	7			2.22		553	0.90					
		1415	8			:.19		5.50	0.87					
		1416	9			1.17		5.48	0.85					
		1413	10			4.16		5.47	0.84					
		1418	11			2.13		5.44	0.81					
		1449	12			2.49		<b>1</b> 30	0.76					
		120	13			2.08		5.39	0.76					3
		1421	14			, Z. 78	•	5.39	0.76			-		
		1-22	15			6.08		5.39	0.76					
		1423	16			2.57		5.38	0.75					
		1425	18			2.07		5.38	0.75				. ,	
		1430				1.97		5.23	0-65					
	Г		80,2615			1.90		5.21	0.58					
	$\vdash$	1440				1.91	-,-	5.22	0.59					
+		1450				1.81		5.12	0.49					
JEG		1500	50			1.79		5.10	0.47					
PROJECT		1510	60			1.20		5.01	0.38					
α,	7	1520	70			1.70		501	438					7 •
	7	1530	80			1.70		5.01	<i>438</i>					
						1			4					•
	2	11:27				5+1.30		4.61	-0.0Z				B	
	1	///				1		1.01	5.02				-	
	-	<del></del>	<del>                                     </del>						<del></del>		<del>  </del>			

HYDRO-SEARCH

RENO . DENVER

CONSULTING HYDROLOGISTS-GEOLOGY

### ROCKY FLATS SOLAR PONDS

### WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1786	09/02/86	5865.26	5866.55	1.29	13.98	6.49	5860.06
	09/05/86					6.54	5860.01
	09/06/86					6.50	5860.05
	09/08/86					6.22	5860.33
	09/09/86					6.31	5860.24
	09/17/86					6.46	5860.09
	09/19/86					6.50	5860.05
	09/22/86					6.33	5860.22
	09/25/86					6.43	5860.12
	10/13/86					6.10	5860.45
	11/26/86					6.35	5860.20
	01/01/87					6.42	5860.13
	02/01/87					6.35	5860.20
	04/01/87					4.54	5862.01
	05/06/87					5.10	5861.45
	06/01/87					5.84	5860.71
	07/08/87					5.70	5860.85
	08/05/87					6.10	5860.45
	09/01/87					6.00	5860.55
	09/28/87					6.30	5860.25
	11/03/87					6.10	5860.45
	12/08/87					6.40	5860.15
	01/07/88					6.40	5860.15
	02/04/88					6.30	5860.25
	03/14/88					6.20	5860.35
	04/11/88					5.20	5861.35

SATURATED THICKNESS IN WELL # 17-86(SP) Apr-88 Jan-88 Oct-87 Jul-87 Apr-87 Jan-87 Oct-86 Jul-86 Apr-86 Jan-86 80 — 90 -70 — 60 20 20 T Pr 20 -100 404 10 Ö

SATURATED THICKNESS (ft.)

DATE

#### INDEX OF DATA

Boring No.: 18-86
Completed as well? Yes
Data in File
X Log of Borehole
X Well Construction Summaries
Well Development Summaries
Hydraulic Conductivity Test Data and Results
Packer Test Data and Results
X Water Level Data
x Saturated Thickness Hydrographs

Rocky Flats Plant

### LOG OF BORING NO. 18-86

Date Drilled 8/21/86 to 8/22/86

Coordinates N 38532.4 E 22729.8

Bori	ng Meth	od Holl	ow Stem Auger Ground Su	rface Elevation	on 5882.82	
Elev. (feet)	Depth S (feet) 7	emple Graphic ype Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content 20 40	Other Tests
			ARTIFICAL FILL  0-0.6'-Sample. Recovered 0.6/0.6'=100%. GRAVEL: pale yellowish brown (10YR 6/2); granite and quartzite sandy gravel; poorly sorted; unconsolidated;dry.  0.6-5.0'-Sample. Recovered 3.4/4.4'=77%. CLAY: moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2); silty; trace gray micaceous quartzite cobbles; poorly sorted; hard; damp.  5.0-8.0'-Sample. Recovered 0.0/3.0'=0%.  ARAPAHOE FORMATION  8.0-10.5'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium light gray (N 6) to grayish black (N 2) with dark yellowish orange (10YR 6/6) mottling; sandy; sandy iron stained intervals from 8.0-8.2' and 9.5-10.3'; dry.  TOTAL DEPTH: 10.5'			
Rema	arks	Logged by:	L. Pivonka	Checke	ed by:	

Project No.

106P06222

Hydro-Search, Inc.

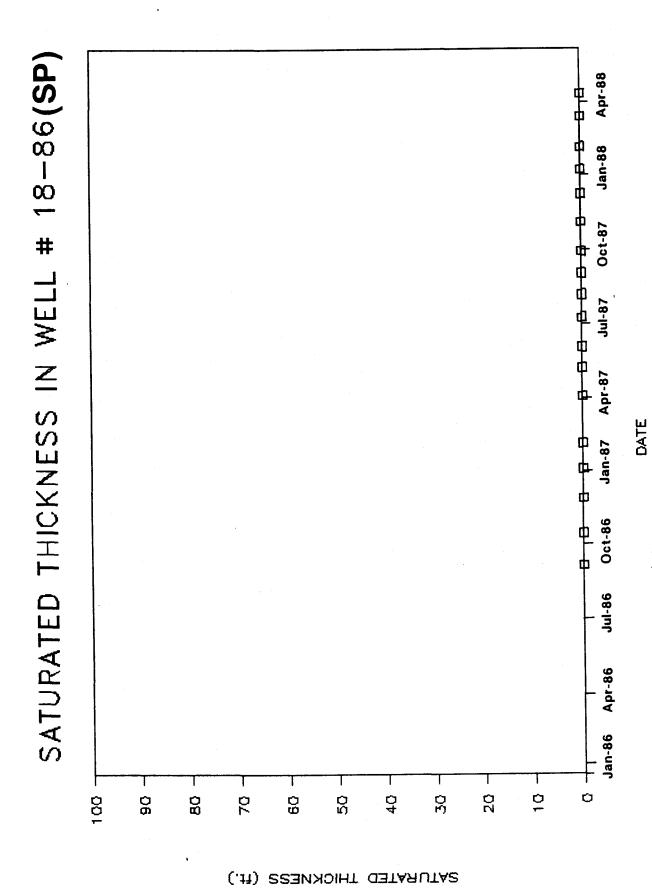
Page 1 of 1

WELL	18-86	

		r			WELL CONSTR	RUCTION S	UMM	ARY		
		l			- LOCATION or COORDS:	ELEVATION: GROUN	ID I EVEI	58	32.82'	
٠		ł			N 38532.4 E 22729.8		F CASIN	589	35.49'	
		$L_2$				T				
		Γ			DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
	1	l		E	TOTAL DEPTH Well: 7.50' Hole: 10.50'	TACY	<u>\$T.</u>	ART	FIN	ISH
			####	綴星	BOREHOLE DIAMETER	TASK	DATE	TIME	DATE	TIME
		Ι,	_		Pole Pole Pili	DRILLING:	1986		1986	1000
İ	-	<b>-</b> 4			DRILLER Boyles Brothers Drilling Co.	7½" auger	8/21	0937	8/21	1023
	- }				15865 W. 5th Avenue Golden, CO (Jim Horn)					
1	- 1				RIG Mobile B-57	GEOPHYS. LOGGING:		<u> </u>		
					BIT(S) Bull nose bit	CASING:				
ଧ୍ର	기욁	L 6				2" stainless	8/26	0836	8/26	0837_
len.	Pivonka				DRILLING FLUID None					
Colden, CO										
					SURFACE CASING 5" x 5' steel w/ locking cap	FILTER PLACEMENT		0837	8/26	0840_
	E .				WELL DESIGN:	CEMENTING:	8/26	0842	8/26	0846
<u>N</u>	N	- 8		<u> </u>		CEVELOPMENT:	9/3	1015_	9/3	1015
LOCATION	PERSONNEL				BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER: <u>Bentonite</u>	8/26	0840	8/26	0842
2	PE				CASING STRING(S): C=CASING S=SCREEN	Demonitee	8/26	0834	8/26	0836
					3.74'- 7.50' S1					
		-10								
1	1	'`								
İ						WELL DEVELOR	MENT	·		
						See Well Deve	ormont	S. mass	, Shoot	<del></del>
		<b>-</b> 12			CASING: CI 2" I.D. Sch. 5 type 316 stain-		ophene	Sumar	Sueec.	
					less steel threaded and flush		<u> </u>			
	ant				iointed.					
	Ы								•	
7	Flats	L 14			SCREEN: SI 2" I.D. Sch. 5 type 316 stain-				<del></del>	
106P06222	E				less steel, threaded and flush	COMMENTS:			,	
질	Rocky				jointed, 0.010" wire wrap screen,			, .		
$\preceq$	坙				O.25' welded bottom cap.  CENTRALIZERS Type 304 stainless steel	No water encou	<u>intered</u>	during	drillin	<u>g.                                    </u>
		16			4.84' - 6.01'	Top of stainle	es ste	el casi	2.6	7'
-							33 344	<u></u>	45	
PROJECT					FILTER MATERIAL 32-42 silica sand					
8		Ì			3.00' - 8.00'					
	•				CEMENT Portland Type I					
		- 18	3		0.00' - 2.00'		<del></del>			
					OTHER 3/8" Bentonite Pellets _2.00' - 3.00'				<del></del>	<del></del>
					<u>8.00' - 10.50'</u>			<del></del>		<del></del>
		_ 20	)						·	
		<u> </u>			HYDRO-SEARCH RENO*DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGISTS

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
1886	09/03/86	5882.82	5885.49	2.67	7.50	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/01/87					-1.00	DRY
	04/01/87					-1.00	DRY
	05/06/87					-1.00	DRY
	06/01/87					-1.00	DRY
	07/08/87					-1.00	DRY
	08/06/87					-1.00	DRY
	09/01/87					-1.00	DRY
	09/28/87					-1.00	DRY
	11/03/87					-1.00	DRY
	12/08/87					-1.00	DRY
	01/07/88					-1.00	DRY
	02/04/88					-1.00	DRY
	03/14/88					-1.00	DRY
•	04/11/88					-1.00	DRY



#### INDEX OF DATA

Boring No.: 20-86							
Completed as well? Yes							
Data in File							
X Log of Borehole							
X Well Construction Summaries							
Well Development Summaries							
Hydraulic Conductivity Test Data and Results							
Packer Test Data and Results							
X Water Level Data							
X Saturated Thickness Hydrographs							

Rocky Flats Plant

## LOG OF BORING NO. 20-86

Date Drilled 9/4/86

Boring Method

Hollow Stem Auger

Coordinates N 38110.3 E 21253.7 Ground Surface Elevation 5960.47

iev. feet)	Depth Sempl (feet) Type	Graphic B Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Confent (%)	Other Tests
	0 //		ARTIFICIAL FILL			
	_//		0-2.0'-Sample.	•		
	- $        -$	1	Recovered 1.7/2.0'=85%.			
	1//	1	SAND: grayish orange		-	
	$-\mathbf{I}/$	200	(10YR 7/4) to dark yellowish orange (10YR		-	
	<b>-</b> //	, O.	6/6) fine- to coarse		_	
ı		1000	grained sand; some			
1	1//	100	granitic pebbles and cobbles; fragments of			
1		0.00	medium gray (N 5)			
ı	- $        -$	10,000	claystone; no apparent			
1	<b>1</b> //	10.00	<pre>bedding; poorly sorted; unconsolidated; dry.</pre>		-	
ł	<b>-5-1</b> //	79.000		_		
- 1		2000	2.0-4.0'-Sample.		_	
- 1	_//		Recovered 2.0/2.0'=100%. GRAVEL: dark yellowish			
1			orange (10YR 6/6) granite			
1	7//	T.00	and quartzite pebbles and			
1	7//	100°	cobbles; some very		_	
	+I//	10.00	<pre>fine-grained sand; slightly calcareous; no</pre>		_	
ı	-1//	Poin	<pre>bedding evident; poorly</pre>		_	
1	- V/	1000	sorted; unconsolidated;			
ł	_//	000	dry.			
		100	4.0-6.5'-Sample.			
I	<b>T</b> //	1000	Recovered 0.3/2.5'=12%.		_	
ı	-10-1//	1000	GFAVEL: dark yellowish orange (10YR 6/6) granitic		_	
1	<b>- - /</b> /	80.0g	pebbles and cobbles; some		-	
ı	-1//	ارزور	fine-grained sand; poorly		_	
	- 1//	000	sorted; unconsolidated; dry.			
l	_//	$\sim 7.7$	dry.			
Ī		000	6.5-7.5'-Sample.			
ı	177		Recovered 0/1.0'=0%.		-	
_	<b>T</b> //	<b>/</b>	BOULDER: drilled out large quartzite boulder.		-	
	-	<b>/</b>				
1	<b>-</b> √/		7.5-12.5'-Sample.	į į		
	<b>-</b>	F====	Recovered 0.1/5.0'=2%. 7.5-10.0'-Cuttings.	1		
L	15//	1	CEMENT RUBBLE; dry.	1		
	_ 13//	1			7	
1	1//	<b>1</b>		1	4	
	<b>-</b> Y/.			1 I	-	
1	- <b>Y</b> /		ARAPAHOE FORMATION		_	
	<b>-</b> V/	[===]	12.5-17.5'-Sample.	1 1		
	1//	E	Recovered 5.0/5.0'=100%.	] !		
				1	٦	
	7//	1 3	12.5-14.8'. CLAYSTONE: dark yellowish orange			
	<b>T</b> //	4	(10YR 6/6); silty; damp.	1		
	<b>- 1</b> //			1		
	<sub>20</sub> - <b>---/</b> /			1	_	
	20 /	<b></b>			1 1 1 1	

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

### LOG OF BORING NO. 20-86

Date Drilled 9/4/86

Boring Method

Hollow Stem Auger

Coordinates N 38110.3 E 21253.7

Elev. Cleet Fype Log Material Description Resistance (Blows/Inch) College (Wilson Tests)  20	5011	ng Method:	Hollo	ow Stem Auger Ground Su	rface Elevation	on 5960.47	
14.8-17.5'. CLAYSTONE: greenish gray (50'x 6/1) to dark gray (N 1): some black (N 1) organic fragments; interbedded sand layers consisting of medium to fine-grained and and slity sand, well sorred; damp.  17.5-2.5'-Sample. Recovered 4.5/4.5'=100%. CLAYSTONE: medium brownish gray (5VR 4/4) to olive gray (5V 4/1); slity; firm; damp.  TOTAL DEPTH: 22.5'	Elev. (feet)		Graphic Log	Material Description	(Blows/Inch)		Other Tests
		-30		greenish gray (5GY 6/1) to dark gray (N 3); some black (N 1) organic fragments; interbedded sand layers consisting of medium to fine-grained sand and silty sand. well sorted; damp.  17.5-22.5'-Sample. Recovered 4.5/4.5'=100%. CLAYSTONE: medium brownish gray (5YR 4/4) to olive gray (5Y 4/1); silty; firm; damp.			
Remarks Logged by: T. Murphy Checked by:	Rema	rks Lo	gged by:	T. Murphy	Checke	d by: JAP	

Project No.

106P06222

Hydro-Search, Inc.

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WELL	20-86	
WELL	20-86	

			WELL CONSTRI	UCTION SI	JMM	ARY		
			0 LOCATION or COORDS:	ELEVATION: GROUN	ID LEVEL		60.47' 62.12'	
		_5	DRILLING SUMMARY:	CONSTRUCTION		LOG:	FIN	ISH
		-5	TOTAL DEPTH Well: 10.55' Hole: 22.00'  BOREHOLE DIAMETER 75"	TASK DRILLING:	<b>DATE</b> 1986	IIME	<b>DATE</b> 1986	TIME
		- 10 <b>-</b>	DRILLER Boyles Brothers Drilling Co.  15865 W. 5th Avenue  Golden, CO (Dave Jarvie)	7년" auger	9/4	1429	9/4	1530
8	Murphy	<b>-</b> 15	RIGMobile B-57  BIT(S)Clay bit	GEOPHYS LOGGING: CASING: 2" stainless	9/4	1722	9/4	1724
Golden,	T. Mu		ORILLING FLUIDNone  SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT		1724	9/4	1730
OCATION	PERSONNEL _	_ 20	WELL DESIGN:	CEMENTING: CEVELOPMENT: OTHER:	9/5 9/12	1020 1307	9/5 9/12	1033 1307
7007	PER		CASING STRING(S): C=CASING S=SCREEN  0.00'	Bentonite	9/4	1730 1715	9/4	1731 1720
				WELL DEVELOR	PMENT			
		- 30	CASING: C: 2" I.D. Sch. 5 type 316 stain— less steel.threaded and flush	See Well Deve	lopment	Summar	y Sheet.	
	Plant	<b>L</b> 35	jointed.  screen: SI 2" I.D. Sch. 5 type 316 stain-					
6222	Rocky Flats P		less steel, threaded and flush jointed, 0.010" wire wrap screen 0.25' welded bottom cap.	COMMENTS:  No water enco	untered	l during	drillin	g
T 106P06222		_40	CENTRALIZERS Type 304 stainless steel 6.62' - 7.77'	Top of stainl	ess_ste	el casi	ng: 1.	65'
PROJECT			FILTER MATERIAL 32-42 silica sand 3.00' - 11.00'  CEMENT Portland Type I	Cave from TD	to 19.2	0'		
		_45	0.00' - 2.00' OTHER 3/8" bentonite pellets 2.00' - 3.00'					
		50	19.20' - 11.00'					

HYDRO-SEARCH RENO-DENVER

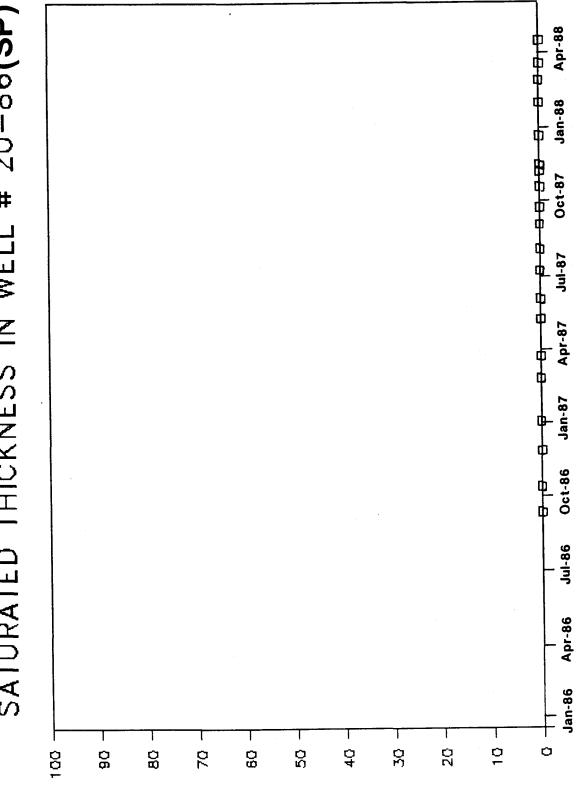
CONSULTING HYDROLOGISTS-GEOLOGISTS

### ROCKY FLATS SOLAR PONDS

### WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2086	09/12/86	5960.47	5962.12	1.65	10.55	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/24/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					11.80	5950.32
	08/04/87					12.00	5950.12
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY
	11/17/87					-1.00	DRY
	12/22/87					-1.00	DRY
	02/01/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

SATURATED THICKNESS IN WELL # 20-86(SP)



SATURATED THICKNESS (ft.)

DATE

#### INDEX OF DATA

Boring No.: 22-86						
Completed as well? Yes						
Data in File						
X Log of Borehole						
X Well Construction Summaries						
Well Development Summaries						
X Hydraulic Conductivity Test Data and Results						
Packer Test Data and Results						
X Water Level Data						
X Saturated Thickness Hydrographs						

Rocky Flats Plant

### LOG OF BORING NO. 22-86

Date Drilled 9/8/86

Boring Method-

Hollow Stem Auger

Coordinates N 37734.9 E 21307.7 **Ground Surface Elevation 5976.81** 

ROCKY FLATS ALLUVIUM  0-3.0'-Sample. Recovered 1.3/3.0'=43t. CLAY: grayish brown (5YR 3/2) to dusky brown (5YR 3/2) to dusky brown (5YR 3/2) to dusky brown (5YR 3/2) to dusky brown (5YR 3/2) Recovered 2.0/2.0'=100*. Recovered 2.0/2.0'=100*. Recovered 2.0/2.0'=100*. Recovered 1.0/2.0'=51*. Recovered 1.0/2.0'=51*. Recovered 1.0/2.0'=51*. Recovered 1.3/2.0'=55*. Recovered 1.3/2.0'=55*. Recovered 1.3/2.0'=55*. Recovered 1.3/2.0'=55*. Recovered 1.3/2.0'=55*. Recovered 1.3/2.0'=55*. Recovered 1.3/2.0'=50*. Reco	Elev. Depth Sant (feet) Typ	de Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Confent 20 40	Other Tests
Recovered 2.0/2.0'=100%.  GRAVEL: dark reddish brown (10YR 3/4) tc grayish olive (10Y 4/2) granite and quartzite pebbles and cobbles; some sand, silt and clay; poorly sorted; unconsolidated; wet.  5.0-7.0'-Sample. Recovered 1.3/2.0'=65%. GRAVEL: pale olive (10Y 3/2) granitic pebbles and coarse to fine-grained sand; silty; trace clay; poorly sorted; calcareous; damp.  7.0-10.0'-Sample. Recovered 0.6/3.0'=20%. GRAVEL: pale olive (10Y 4/2) granitic pebbles and coarse to fine-grained sand; silty; trace clay; poorly sorted; calcareous; damp.	2.5		0-3.0'-Sample. Recovered 1.3/3.0'=43%. CLAY: grayish brown (5YR 3/2) to dusky brown (5YR 3/2); some quartzite pebbles; poorly sorted;			
Recovered 0.6/3.0'=20%.  GRAVEL: pale olive (10Y)  3/2) granitic pebbles and cobbles; some coarse to fine-grained sand and silt; trace clay; poorly		0.00.00.00.00.00.00.00.00.00.00.00.00.0	Recovered 2.0/2.0'=100%. GRAVEL: dark reddish brown (10YR 3/4) tc grayish olive (10Y 4/2) granite and quartzite pebbles and cobbles; some sand, silt and clay; poorly sorted; unconsolidated; wet.  5.0-7.0'-Sample. Recovered 1.3/2.0'=65%. GRAVEL: pale olive (10Y 3/2) granitic pebbles and coarse to fine-grained sand; silty; trace clay; poorly sorted; calcareous;			
	7.5	1000	Recovered 0.6/3.0'=20%. GRAVEL: pale olive (10Y 3/2) granitic pebbles and cobbles; some coarse to fine-grained sand and silt; trace clay; poorly		- - - - - - - - -	

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

### LOG OF BORING NO. 22-86

Date Drilled 9/8/86

Boring Method:

Hollow Stem Auger

Coordinates N 37734.9 E 21307.7 Ground Surface Elevation 5976.81

			HOLLO	w Stem Auger Giodia S	OLINCE FIRANTI	18.0/65 110	
Elev. (feet)	Depth (feet)	Semple Type	Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content 20 40	Other Tests
	'10		000 00:	10.0-12.0'-Sample. Recovered 2.0/2.0'=100%.		<b>V</b>	
	-			10.0-11.0'. GRAVEL: Same as above; wet.		_	
				ARAPAHOE FORMATION		-	
	12.5			11.0-12.0'. SANDSTONE: medium light gray (N 6); medium to fine-grained silty sand with some clay; few dark yellowish orange (10YR 6/6) iron staining; moderately sorted; firm; moist.			
	11111			12.0-14.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6); medium to fine-grained sand and silty sand; increased iron staining; clayey layers at 12.9 and 13.4'; well		-	
	. — — 15 —			sorted; firm; moist.  14.0-16.0'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6); medium to fine-grained sand and silty sandstone with interbedded claystone; increase in clay content;			
-	1			slightly calcareous fractures at 14.4'; moderately sorted; firm; moist.  16.0-18.0'-Sample.		-	-
	17.5			Recovered 2.0/2.0'=100%. SANDSTONE: medium light gray (N 6) interbedded sandstone and claystone; increase in dark yellowish orange iron staining (10YR 6/6); increase in clay			
	1			content; moderately sorted; firm; moist.  18.0-19.0'-Sample. Recovered 1.0/1.0'=100%.	_	-	
	1 1 1			CLAYSTONE: greenish gray (5GY 6/1) to medium light gray (N 6); with interbedded fine-grained, silty, clayey sand; firm; moist.		-	
	20						
Rema	irks	Logg	ged by:	T. Murphy	Checke	d by:	

Project No.

106P06222

Hydro-Search, Inc.

Page 2 of 3

Rocky Flats Plant

### LOG OF BORING NO. 22-86

Date Drilled 9/8/86

Coordinates N 37734.9 E 21307.7 Ground Surface Flevation 5976 81

Boring - Method . Hollow Stem Auger Ground Surface Elevation 5976.81						
Elev. (feet)	Depth S (feet) T	emple Graphi ype Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Conjent Conjent 20 40	Other Tests
	20	//===				
I	7		19.0-21.0'-Sample. Recovered 2.0/2.0'=100%.	1 1		
ı	7	//===	CLAYSTONE: Same as above;	1 1		
	1		moist.		_	
1	$\dashv$		21.0-23.0'-Sample.	1		
- 1			Recovered 2.0/2.0'=100%.	1		l
l			CLAYSTONE: dark gray (N 4) to greenish gray (5GY			t
ı			6/1); with interbedded	1	-	1
I	/		fine-grained, clayey sandstone; some iron	1	_	1
	<b>→</b>		staining; firm; moist.	- 1 - 1	-	1
1			22 0-24 01 01-	1		
			23.0-24.0'-Sample. Recovered 1.0/1.0'=100%.	1 1	-	ł
1			CLAYSTONE: dark gray (N			1
			4) to greenish gray (5GY 6/1); with minor	1	-	1
	1		interbedded fine-grained		_	1
	<b>1</b>		sandstone; firm; moist.		_	
	1		24.0-26.0'-Sample.		_	1
- 1	<del> </del>		Recovered 2.0/2.0'=100%.	1 1		]
	-∤		CLAYSTONE: dark gray (N 4) to greenish gray (5GY	1 1	_	1
			6/1); with interbedded	1 1	-	1
- 1	-∤		fine-grained medium to dark gray (N 5 to N 6)	1 1	-	1
	<b>—</b> 25 <b>—</b> /		sandsstone; firm; damp.	1	-	1
	1		4	1 1	-	1
1	/		<i></i>		-	1
1	- ∤		TOTAL DEPTH: 26.0'	1 1	<b>-</b>	1
	_	/ /	₹		-	-
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Rem	<u> كريجينان</u>	Logged b	y: T. Mu <del>rp</del> hy	Check	ed by:	
Project No.  Hydro-Search, Inc.  Page 3 of 3						

WELL	22-86		
W			

		- 0			WELL CONSTR	RUCTION S	UMM	ARY		
					N 37734.9 E 21307.7				76.81' 78.05'	
		5		300		1000	CASIN	c	70.02	
		<b> </b>		0	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:	_	
				0.0	ТОТАL DEPTH Well: 11.20' Hole: 26.00'	TASK	<u>ST</u>	ART	FIN	<u>15H</u>
				1.5	BOREHOLE DIAMETER		<b>DATE</b> 1986	TIME	DATE 1986	TIME
		- 10			DRILLER Boyles Brothers Drilling Co.	DRILLING:	9/8	1000	9/8	1629
				,0	15865 W. 5th Avenue					
					Golden, CO (Dave Jarvie)					
					RIGMobile B-57	GEOPHYS. LOGGING:				
8	Murphy				BIT(S)	CASING:		_		
ə	Ψ	<b>-</b> 15				2" stainless	9/8_	1734	9/8	1735
Colden,	ī				DRILLING FLUID None					
					SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT	9/8	1738	9/8	1742
ł	-				cap	CEMENTING:	9/8	1748	9/8	1800
Z	PERSONNEL	20		<b>高等</b>	WELL DESIGN:		9/12	1620	9/19	134
OCATION	SON				BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
00	ER				CASING STRING(S): C=CASING S=SCREEN	Bentonite	9/8	1742	9/8	1748
_	•				0.00' 3.20' C1		9/8	1723	9/8	1725
			1		3.20' - 11.20' SI	<del></del>				
		25								
1	1								<u> </u>	
						WELL DEVELO	PMENT			
	- {									
		- 30		1		See Well Deve	Lopment	Summary	Sheet.	
					CASING: CI 2" I.D. Sch. 5 type 316 stain-			· 	<u> </u>	
					less steel threaded and flush					
	- 1				jointed.					
	Plant	-			SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					<del></del>
		35			less steel, threaded and flush					
77	at				jointed, 0.010" wire wrap screen	COMMENTS:				
106P06222	Rocky Flats				0.25' welded bottom cap.	Water encount	ered at	10.5'	during d	rilling
99	SC				CENTRALIZERS Type 304 stainless steel			*********		
ł		- 40			6.10' - 7.35'	Top of · stainl	ess ste	el casir	1g: 1.2	4
PROJECT					FILTER MATERIAL 32-42 silica sand	Cave from TD	to 22.6	0'		
ROJ	ı	l			2.50' - 11.40'					
. с	•				CEMENT Portland Type I					
		<b>-</b> 45			0.00' - 2.00'					
					OTHER 3/8" bentonite pellets					
		}		-	2.00' - 2.50' 11.40' - 22.60'					
					11.70 42.00					
		L 50								
					HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGISTS



CLIENT/SUBJECT	W.O. NO			
TASK DESCRIPTION		· · · · · · · · · · · · · · · · · · ·	TASK NO	
PREPARED BY	DEPT	DATE	APPROVED BY	
MATH CHECK BY	DEPT	DATE		
METHOD REV. BY	DEDT	DATE (0/21/88)	DEPT DATE	

WELL 22-86

Hydraulic Conductivity (cm/sec) = 8.7 × 10-6

Static Water Level (ft below G.L.) = 7.27'

Screened Interval (ft below 6.1.)= 3.20-11.20

3.20 - 11.00' Gravel

11.0 - 11.20 sandstone

Method of Analysis (Bouwer, 1778).

#### RAW DATA

WELL # 22-86

WELL DIAMETER= 7.25 INCHES
CASING DIAMETER= 2.00 INCHES
VOLUME OF WATER= .64 GALLONS
LENGTH OF AQUIFER TESTED= 3.93 FEET
VALUE OF H0= 3.93 FEET
STATIC WATER LEVEL= 7.27 FEET
LENGTH OF SCREEN= 8.00 FEET
WATER TABLE TO BOTTOM OF WELL= 3.93 FEET

\*Bailed well dry in 6 min.; 6.4 gal. = Volume in casing slug TEST DATA: facreen.

TIME	WATER LEVEL (FEET)	TIME SINCE TEST BEGAN (MINUTES)
TIME  0. 8.30 0. 9. 0 0. 9.30 0.10. 0 0.10.30 0.11. 0 0.12. 0 0.12. 0 0.12. 30 0.13. 0 0.14. 0 0.15. 0 0.16. 0 0.17. 0 0.18. 0 0.19. 0 0.20. 0 0.21. 0 0.22. 0 0.23. 0 0.24. 0 0.30. 0 0.40. 0 0.49. 0 0.54. 0 0.59. 0 1. 4. 0 1. 9. 0 1.21. 0 1.34. 0		
1.34. 0 1.44. 0 1.54. 0 2. 5. 0 2.14. 0 2.24. 0	7.69 7.66 7.63 7.61 7.58 7.54	94.00 104.00 114.00 125.00 134.00 144.00

WELL # 22-86

WELL DIAMETER= 7.25 INCHES CASING DIAMETER= 2.00 INCHES VOLUME OF WATER REMOVED OR ADDED TO WELL= .64 GALLONS LENGTH OF AQUIFER TESTED= 3.93 FEET VALUE OF HO= 3.93 FEET STATIC WATER LEVEL= 7.27 FEET

#### SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIME (1/MINUTES)
8.50	10.46	3.19	.812	.118
9.00	10.39	3.13	.794	.111
9.50	10.33	2.90	.738	.105
10.00	10.11	2.84		
10.50	10.11		.723	.100
11.00	9.93	2.80	.712	.095
11.50		2.66	.677	.091
12.00	9.81	2.54	.646	.087
12.50	9.72	2.45	.623	.083
13.00	9.64	2.37	.603	.080
	9.52	2.25	.573	.077
14.00	9.35	2.08	.529	.071
15.00	9.17	1.90	.483	.067
16.00	8.98	1.71	.435	.063
17.00	8.85	1.58	.402	.059
18.00	8.74	1.47	.374	.056
19.00	8.49	1.22	.310	.053
20.00	8.37	1.10	.280	.050
21.00	8.20	.93	.237	.048
22.00	8.10	.83	. 211	.045
23.00	8.02	.75	.191	.043
24.00	7.93	.66	.168	.042
30.00	7.92	.65	.165	.033
40.00	7.91	.64	.163	.025
49.00	7.85	. 58	.148	.020
54.00	7.82	.55	.140	.019
59.00	7.80	.53	.135	.017
64.00	7.78	.51	.130	.016
69.00	7.74	. 47	.120	.014
81.00	7.71	. 44	.112	.012
94.00	7.69	.42	.107	.011
104.00	7.66	.39	.099	.010
114.00	7.63	.36	.092	.009
125.00	7.61	.34	.087	.008
134.00	7.58	.31	.079	.007
144.00	7.54	. 27	.069	.007

WELL # 22-86

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=8.98E-04/ MATCH TIME (IN MINUTES) STORAGE COEF= 7.61E-02\* ALPHA COMPUTER CALCULATES ALPHA=1.00E-05 MATCH TIME= 7.5

PERMEABILITY= 1.20E-04 CM/SEC STORAGE COEF=7.61E-07 CORRELATION NUMBER= 1.00

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=1.15E-03 / LAG TIME BOUWER PERMEABILTY=1.00E-03 \* -SLOPE

COMPUTER CALCULATES

------

PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THEEQUATION

FOR X ON Y: HVORSLEV PERMEABILITY=5.38E-05 CM/SEC BOUWER PERMEABILITY=7.43E-06CM/SEC

FOR Y ON X: HVORSLEV PERMEABILITY=4.32E-05 CM/SEC BOUWER PERMEABILITY=9.94E-06 CM/SEC

AVERAGE HVORSLEV PERMEABILITY=4.79E-05 CM/SEC AVERAGE BOUWER PERMEABILITY=8.69E-06 CM/SEC REGRESSION STATISTICS

X ON Y

INTERCEPT= -.27

SLOPE=-7.40E-03

Y ON X

INTERCEPT= -.17

SLOPE=-9.90E-03

CORRELATION COEFFICIENT= -.86

CALCULATIONS INDICATE THAT A VALUE OF 6.72 FEET FOR HO OR A VALUE OF 1.529 INCHES FOR EFFECTIVE CASING DIA. MAY YIELD BETTER RESULTS

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METH

PERMEABILITY=8.79E-04 / SLOPE PERMEABILITY=3.09E-05 CM/SEC REGRESSION STATISTICS

X ON Y

INTERCEPT= -.03

SLOPE= 2.79E+01

Y ON X

INTERCEPT= -.08

SLOPE = 2.90E + 01

CORRELATION COEFFICIENT= .98

12:05:27.40 BAIL DOWN - RECOVERY ANALYSIS FOR WELL 22-86 FRI 06-10-1

WELL #	PERMEABILITY METHOD 1	PERMEABILITY METHOD 2	STORAGE COEF METHOD 2	PERMEABILITY METHOD 3	PERMEABILIT METHOD 4
22-86	4.79E-05	1.20E-04	7.61E-07	3.09E-05	8.69E-06

\* METHOD 1 IS HVORSLEV

METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD 3 IS FERRIS AND KNOWLES

METHOD 4 IS BOUWER

### AQUIFER TEST DATA

PUMPING or OBSERVATION WELL PUMPING or RECOVERY DATA

TYPE OF AQUIFER TEST Bail down HOW Q MEASURED N/A 64.11 HOW W. L.'S MEASURED OF YOUTH OR RAD. / DIST. OF/FROM PUMPING WELL	DEPTH OF P	PUMPING OF RECOVERY DATA PAGE OF  UMP/AIRPIPE Idte 9/2
MEAS. POINT FOR W.L.'s	PUMP OFF: d	FAQUIFER TEST /36 min.
TIME	WATER LEVEL DATA	DISCHARGE

3,		Ε	LEVATIO	N OF ME	AS. POIN	IT	NIA 7 DURATION			N OF AQUIFER TEST		136 min.			
3	4	Γ		TIN	1E		WATER LEVEL DATA					ED			
3	Z		t = _	0858:	_	′ = o	STATIC	WATER L		5+3.5	2.	DISCH	IARGE	8≻	COMMENTS
Ser Pen,	ergene	٦	CLOCK					CONVERSIONS			T	READ-	٥	208	COMMENTS
1	ان	٦	TIME	1	t'		READING	CORRECTIONS	LEVEL	s or s':		ING	•	RE	ļ <u></u>
H	AD	1	2045				5,352	-1.25 50	7.27						544 fic
à	2	$\perp$	0250	6											Begin bailing
6	M.	Ш	085 6	6							5'	~	3.25		Boiled dry
		<u>√</u>	000		Ø		10+578	,1	10.53	-0.07	- 3.26			90	Begin MONTH
Flars	İ		130	Ţ	:30		10+171		10.46	-0.07	-3.19			1	
H	, perce	Ш	0859		2:00		10+1:64	<i>I</i> •	10.39	-0.22	- 3.12				
	à		:30		1:38		10+1.47	/,	10.17	-0.86	- 2.90				
3	0	Ш	0900		2:00		10+1.36	1.	10.11	-0:04	-2.84				
3	K	П	:30	1	71.50		1941.32			-0.14	-2.80				
W	7	П	0001		Z:00		10+1-18	,,	9.93	-o.1Z	-2.66			-	
l	بہ	П	130		2:23		10+1.06	1.1	9.21	-0.09	-2.54				
NO	Ž	П	0102		2:00		10+0.97		9.72	-0.08	-2.45				
ΑŢ	SO	П	130		2:30		10+089	"	9.64	-0.12	-2.37			1	
COCATION	PERSONNEL	П	0903		5:00		10+0.77			-0.17	-2.25				
_	α.	H	0904		6:00		10+0.60	.,	9.35	-0.18	-2.08			:	
			0905	1	7;00		10.40.42	.,	9.17	-0.19	-1.90				
		H	2006		8:00			,	8.98	-0.13	-1.71				
		H	2007		9:00		10+0.23		8.85	-0.11	-1.58			1	-
		$\mathbf{H}$	1908	<u> </u>	10:00				8.74	-0.25	-1.47				
		H	2909		11:00		51 4.99		8.49		-1.22				
		H		<del> </del>			C14.74	,,		-0./Z	-1.10	1 1			
		H	09/0		/2:00		5+ 4,62		8.37	-0.17	-0.93			,	
22		+	79//		157.00		5-1.25	"	B.20	-0./0	0.83			í	
1		$\vdash$	2012		2:06		5+4,35		8,10	70.08					
>		$\vdash$	<u>~9/3</u>		<u>/</u> €:00		514.27	- ''		-0.09	-0.75	<del>  </del>			
6		-	09/4		15:00		5+ 1.18	1.	7.93	-0.00	-0.66	<del>  </del>	-		
9		-	1916		18:00		5+4.18	1,	7.93	-0.06	-0.66			-	
9		$\vdash$	09/8		20:05		5+4.18		7.93	-0.01	- 0.66			+-	
1		+	0927		7.27.08		-S+ 417			-0.08	-0.65			+-	
		H	0922		-a-15		5-4-17	- "	7.92	-000	-0.65			+	
		-	0924		25:00		c+1/7		7.92		-0.65			+	
- 1		+	2736		22:08		5+ 4.17	-, "	7.92	0.00	-0.65			1	
.		+	0928		3.7500		5+4.17				-0.65			-	
ECT		1	0930		32: 20		5+4.16		7.91		-0.6×			4	
PROJECT		-	0932	<del> </del>	54.44		511.17		7.92	0.00	-0.65				
PR		-	0934		762.13		5+4.17		7.9Z	-0.07	-0.65	$\vdash \vdash \vdash$		$\dashv$	
		L	093?		2/:00		5+4.10			0.03	058		l	4	
		L	0944		46:00		4.07	1,	7.82	-0.02	-0·st			4	
		H	COMA		57:00		5+1.05	.,,	7.80	0.02	- 0.53			$\perp$	
		1	0954	<u> </u>	56:00		5+4.03	Ji .	7-78	-0.04	-0.51			1	·
		L	0957	***	61:00		C+3.99	· u	7-74	000	-0.47			1	
		$\perp$	1005	\$300	61:00		54 3.99	-1.2530	7.74	-0.03	-047				Gain Inin.

HYDRO-SEARCH

0858

RENO . DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

### AQUIFER TEST DATA

WELL 22-86

PUMPING OF OBSERVATION WELL

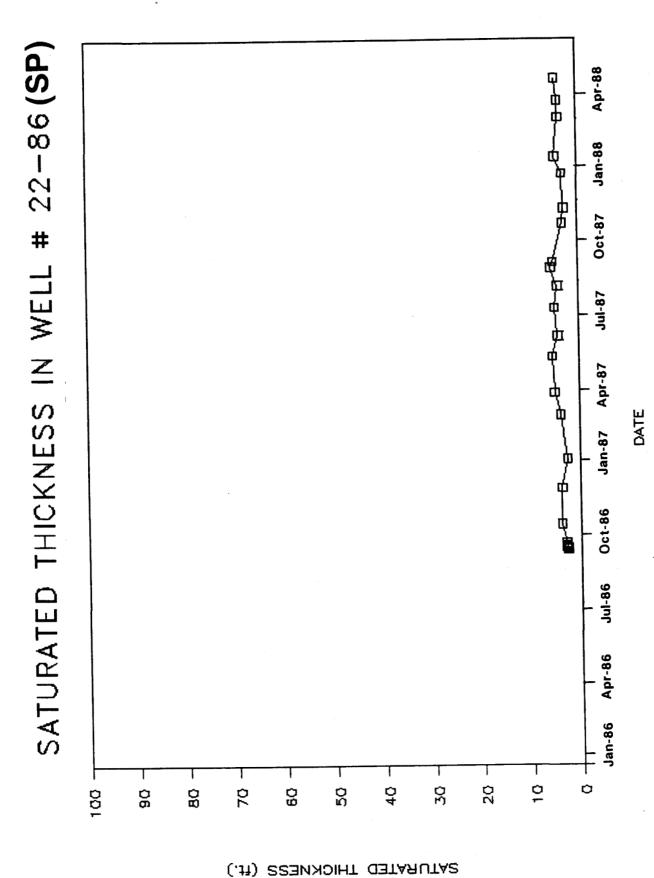
PUMPING OF RECOVERY-DATA

PAGE 2 OF 2

		HC	W Q ME	ASURE	TEST_ <u>&amp;</u> D <i>N_</i> SURED -	<u>A</u>	lown - S	20 ve	<u>, y</u>		DERTH O	F PUMP/A	P	\GE	<u> 2</u> _	ECOVERY-DATA
		PA	W W.L.:	OF/FR	OM PUMI	DING W	EU	7								ime <u>27 /4</u>
1		ME	AS. POI	NT FOR	W i 'e	2054	ede Z"	1 54	in 's	SC C50	PUMP OF	F: date	5/4			ime
ů		EL	EVATION	OF ME	AS. POI	NT	7			· · · ·	DURATIO	N OF AQUIF	ER TE	ST	13	6 AURA
· •				TII	ИE		STATIO			R LEVE		1. <u>1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1</u>	DISC	HARGE	RDED	
bowern		0 •			1 1					WATER LEVEL	s or s'		READ-	0	RECO	COMMENTS
.4			1011		73:00		5+3.96	7			0.00	-0.44			gp	Gain / Min.
Plant	7		10/4		76:00		5+3.96	1	/	7-71	0.00	-0.94		1	11	
1/2	11. Sover 97		1019		9/:00		5+3.96			7-71					$\prod$	
4	ò		1024		86:00		5+3.94		1		-0.03	<del></del>				
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2	2	$\vdash$	1094		106:00		5+3.88	<del>                                     </del>	<del>                                     </del>	7.65		<del></del>			11	James meta A
1	1		1055		117:00	<del>                                     </del>	5+ 3.86				-0.03			<u> </u>	H	
3	Parce	$\vdash$	1104		126:00		5+3.83	1			-0.04	1		<u> </u>	11	-90% Recovery
Rocky	a		1114		136:00						1				90	1010 Euglay
3	1	$\vdash$	///4		/36.00		513.79	-1.25	59.	7.54	-0:	0.27		<del> </del>	72	
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		$\vdash$					<del> </del>		<u>7</u>	8- 2.9	3 - 8.			ļ	<u> </u>	
		<u> </u>					<del> </del>	ļ			07 5	3.85			<u> </u>	
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# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2286	09/12/86	5976.81	5978.05	1.24	11.20	8.38	5969.67
	09/13/86					8.52	5969.53
	09/15/86					8.25	5969.80
	09/16/86					8.22	5969.83
	09/17/86					8.28	5969.77
	09/19/86					8.22	5969.83
	10/13/86					7.22	5970.83
	11/26/86					7.35	5970.70
	01/01/87					8.50	5969.55
	02/25/87					7.29	5970.76
	03/24/87					6.17	5971.88
	05/08/87					5.71	5972.34
	06/03/87					6.80	5971.25
	07/08/87					6.25	5971.80
	08/04/87					6.80	5971.25
	08/27/87					5.60	5972.45
	09/03/87					5.90	5972.15
	10/21/87					8.00	5970.05
	11/09/87			V		8.40	5969.65
	12/21/87					8.00	5970.05
	01/11/88		•			6.60	5971.45
	02/29/88					7.30	5970.75
	03/21/88					7.20	5970.85
	04/18/88					6.70	5971.35



### INDEX OF DATA

Boring No.: 23-86
Completed as well? Yes
Data in File
X Log of Borehole
X Well Construction Summaries
Well Development Summaries
X Hydraulic Conductivity Test Data and Results
X Packer Test Data and Results
X Water Level Data
X Saturated Thickness Hydrographs

Project No.

106P06222

Rocky Flats Plant

# LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

Bori	ng Method	Hollo	w Stem Auger/NC core Ground Su	rface Elevation	on 5981.18	
Elev. (feet)	Depth Sample (feet) Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	င်စ်ဂျိန်ဂ်t 20 40	Other Tests
	0 //	000	ARTIFICIAL FILL			
	<b>-</b>   <b>- </b> / /	0.0	a a st summary	1	_	
	_///	0.00	0-2.5'-Sample. Recovered		-	
	//	000	1.5/2.5'=60%. Pale GRAVEL: reddish brown		_	
	<b>-</b>	200	(10R 5/4) to light olive			
	-1//	000	gray (5Y 5/2) sand, silt		_	
	- Y /	000	and pebbles; some			
		ے ہ	quartzite cobbles;		_	1
		.00	calcareous; poorly sorted;		_	
	-//	0.88	angular; unconsolidated; drv.			
	_//	2000	2.5-5.0'-Sample.	į	-	1
			Recovered 1.2/2.5'=48%.		_	1 1
	1 7/	P: $Q$	GRAVEL: yellowish gray			
	<b>├</b> 5 <b>┤</b> //	0.00	(5Y 8/4) sand, silt and		•	1
	1 1/	800	pebbles; calcareous;		-	1
	V/	80	<pre>poorly sorted; angular; damp.</pre>	1	-	4 1
	I 7//	<b>*</b> 00:9	5.0-7.0'-Sample.		_	j 1
	1 <b>- 1</b> / .	p	Recovered 0.7/2.0'=35%.	1	1	1 1
	I <i>I</i> //	000	GRAVEL: pale olive (10Y		-	1 1
ı	<b> </b>	0.00	6/2) granite and quartzite		-	-
I			<pre>pebbles; some sand; trace clay and silt; calcareous;</pre>			
1	I 7//	2000	poorly sorted; compacted;			
	I - I / /		damp.	1	_	
l	<b>-</b>  //		7.0-9.5'-Sample.		-	1 1
1	$\mathbf{L} \mathbf{L} \mathbf{L} \mathbf{L} \mathbf{L} \mathbf{L} \mathbf{L} \mathbf{L} $	T====	Recovered 1.7/2.5'=68%.	i e		-
ł	<b> </b>   / /	<b>4</b>	\7.0-8.2'. GRAVEL: Same			
	10-17		as above; damp.			
ı	I -1//			-1	1	1
ł	l -1//	<b>1</b>	ARAPAHOE FORMATION		!	1
	1 1/		8.2-9.5'. CLAYSTONE:		-	1
1	<b>1</b> _ <b>Y</b> /		pale olive (10Y 6/2);			-
	$\mathbf{I} = \mathbf{I} / \mathbf{I}$	4====	silty; calcite along			1 1
	1 7/		fractures at 8.5', 9.0', and 9.5'; some dark			1
_	<b>I</b> → / /		yellowish orange (10YR		•	1
	1 1/	<b>A</b>	6/6) staining; firm; damp.		-	-{
1	I I I			1		4
1		1	9.5-12.0'-Sample.	1	i .	
I	1 -1/	<b>*</b>	Recovered 2.5/2.5'=100%.	1		
	<b>—</b> 15 <b>—</b> /		CLAYSTONE: yellowish gray		•	1
	1 1/		to greenish gray (5Y 7/2 to 5GY 6/1); sandy and	i		┫
		4	silty in upper 1.5'	i i		4
		<b>*****</b>	increasing in clay content			_1
	1 1/		with depth; some dark	1	1	7
		1	yellowish orange (10YR	1	1	1
1	1 1/		6/6) iron staining; ironstone at 10.5';	1	1	-1
•	1 7/		calcareous layers at 9.5'	ł	1	_
	1 7/	A	and 10.7'; firm; damp.	1		1
	1 - <i>X</i>		1	1	1	7
•	1 4/					4
•	1 1/		1	ł	1	4
1	20 7	/===				
6				Charle	ked by:	
неп	narks L	ogged by	: T. Murphy	Check	NEU DY XXX	
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Rocky Flats Plant

### LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method - Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

Elev. feet)	(feet)	emple Graphic ype Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	20		12.0-17.0'-Sample. Recovered 5.0/5.0'=100%.		, , , , , ,	
	1		CLAYSTONE: light olive	1	·	
			gray (5Y 5/2) to olive			
	7		<pre>gray (5Y 3/2); silty; calcareous layer at 13.5';</pre>			
			firm: damp_			
	<b>1</b>	//	17.0-22.0'-Sample.		•	
	<b>-</b>		Recovered 5.0/5.0'=100%. CLAYSTONE: light olive	1	_	1
	<b>⊢</b>		gray (5Y 5/2); silty;		_	
	<b>-</b>  √		trace calcite at 18.1';		_	
	-1	/ /	trace dark yellowish orange (10YR 6/6) iron		_	Į
	_25	//===	staining; firm; damp.	1	_	1
			22 2 27 21 22-12		<u> </u>	1
	7	//===	22.0-27.0'-Sample. Recovered 5.0/5.0'=100%.			1
	<b>-</b>  ∕	/	CLAYSTONE: light olive	1	_	1
	<b>│                                    </b>	/ / =====	gray to olive gray (5Y 5/2		<del>-</del>	1
	<b>-</b>		to 5Y 3/2); silty; some dark yellowish orange			
			(10YR 6/6) iron staining;		_	ł
1	_/		some black organic		_	1
			fragments; firm; damp.		_	
i			27.0-32.0'-Sample.	1	_	
			Recovered 5.0/5.0'=100%.			
	1 1		CLAYSTONE: medium dark gray (N 4); silty; firm;		-	1
	30		damp.		-	1
	- ∕				-	1
	<b>│</b>		33.0-38.0'-Sample. Recovered 5.0/5.0'=100%.			ł
			RQD 4.9/5.0'=98%.		_	4
			CLAYSTONE: dusky yellow		_	1
		//===	(5Y 6/4) to light olive gray (5Y 5/2) to medium		_	1
	7	//===	light gray (N 5); trace	1		1.
_	-		silt; some organic		-	1
-	-		fragments; dark yellowish orange (10YR 6/6) mottling		-	1
	-		in light olive gray areas;		-	1
	4		no apparent fractures;		-	-
	<b>—35 —</b>		<pre>moderately soft to firm; damp.</pre>		-	4
					_	1
	1		38.0-40.9'-Sample.			]
			Recovered 2.0/2.9'=69%. RQD 2.0/2.0'=100%.		_	1
	1 1		CLAYSTONE: medium light		•	1
	$\vdash$		gray (N 5); iron staining	l	-	1
	-		at 39.0'; subvertical fracture with iron		-	1
	-		staining from 39.0' to	1	-	1
	L 1		39.8'; core has a mottled appearence with yellowish		-	4
			gray (5Y 8/1) stains			1
			throughout; firm to			_
	40	儿童	moderately soft; damp.			
Rema	arka	Logged by:	T. Murchy	Checke	d by: JIP	

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Rocky Flats Plant

## LOG OF BORING NO. 23-86

 Date Drilled
 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates
 N
 37355.0
 E
 21154.4

 Boring Method.
 Hollow Stem Auger/NC core
 Ground Surface Elevation
 5981.18

Elev. (feet)	(1eet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests
	40		芸芸	40.9-45.9'-Sample.			
				Recovered 2.8/5.0'=56%.		-	
				RQD 1.6/2.8'=57%.		7	
	_			CLAYSTONE: olive gray (5Y		_	
				4/1); trace silt; some			
i			E	organic fragments;			
	_			vertical limonite filled fracture from 40.9' to		-	:
	_			42.5'; horizontal limonite		_	
				filled fracture at 41.9';			
				firm to moderately soft;	1		
				damp.		-	
	, -						
	45 <b>—</b>			45.9-50.9'-Sample.			
	-	• ] ] ]	<b>E</b>	Recovered 4.8/5.0=96%.		_	
			<b>三</b>	RQD 4.2/4.8'=86%. 45.9'-50.2'. CLAYSTONE:		_	
				medium (N 5) to medium			
	-			dark gray (N 4). Highly	]		
	_		F	fractured interval with		_	
	_	8		limonite along fracture		_	ł
				planes (2 mm wide) from			
				48.3' to 49.6'; top 4.0' of core has abundant			
	_			organics (wood fragments);		-	
				firm; damp.		_	
			F	·		_	
	50	1		50.2'-50.9'. CLAYSTONE:			
	—∞-	1		dusky yellow (5Y 6/4).		-	
	_			EO O EE OL G		_	į.
				50.9-55.9'-Sample. Recovered 4.0/5.0'=80%.		_	
			F====	RQD 2.6/4.0'=65%. 50.9'-			1
	-	1		51.5'. CLAYSTONE: light		_	1
	_	4		olivegray(5Y5/2); heavy		_	ł
	_	1		limonite along fracture		_	I
	_			planes.			l
		1		51.5'-52.6'. CLAYSTONE: medium dark gray (N 4)		-	1
-	_	4		claystone with interbedded	1	_	ł
		]		dusky yellow (5Y 6/4)			•
				clayey siltstone.			1
	-	1		52.6'-55.9'. CLAYSTONE:			1
	<b></b> 55 <b></b>	4		medium dark gray (N 4);		-	
	_			silty; occasional subvertical fracture with		_	i
				limonite stain (up to	1		1
	I –	1		0.7'long); firm; damp.	1	-	1
	-	4		,,, <del></del>		-	ł
		1   1			1	i –	J
				55.9-60.9'-Sample.			
İ	•	<b>7</b>		Recovered 3.8/4.6'=83%.			1
	I –	4		RQD 2.5/3.8'=66%.		-	i
	_	4		CLAYSTONE: olive gray (5Y		_	ł
	l _			3/2) to medium dark gray (N 4); silty; trace iron			]
	l <sup>-</sup>	1		staining at top of core;			I
		1		firm; damp.		-	1
<b></b>	60		J			┸	L
Rem	arks	Log	gged by:	T. Murphy	Checke	ed by:	

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Rocky Flats Plant

### LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method - Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

Born	ng Meti	nod ·	Hollo	ow Stem Auger/NC core Ground Su	riace Elevatio	on 5981.18	
Elev. (feet)		Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%)	Other Tests
	60						
	-				• [	-	
	_			60.9-65.5'-Sample.	ŀ	-	
				Recovered 4.6/4.6'=100%.			
				RQD 4.3/4.6'=93%.			
			手掌	SILTSTONE: dark gray (N			
	-			3) grading downward into		4	
				<pre>dark greenish gray (5GY 4/1) clayey siltstone;</pre>			
				some organic wood	l i		
				fragments; firm; damp.			
			E		1		
I I	_			65.5-70.5'-Sample.	j İ	⊢ ⊣	
	<del>-6</del> 5 -			Recovered 5.0/5.0'=100%. RQD 3.7/5.0'=74%.	]		
	<u> </u>			SILTSTONE: dark greenish	į l		
				gray (5GY 4/1); clayey;	1		
	-			trace very fine-grained	į į	-	
				sand; dark gray (N 3)	§ 1		
				clayey siltstone from 68.5 to 70.5'; calcareous	[	·	
				layer at 66.5 with slight		1	
	-			dark yellowish orange	j l	-	İ
				(10YR 6/6) iron stains;	]		
				firm; damp.	] ]		
					j l		
					<b>[</b> ]	-	
	_					_	
ļ l	70				1		
						٦	
	٦			70 5-75 51-5	j l	7	
	-			70.5-75.5'-Sample. Recovered 2.5/5.0'=50%.		-	
				RQD 0.0/2.5'=0%.			
	_			CLAYSTONE: dark greenish	] ]		
				gray (5GY 4/1); silty;			
	-			trace very fine-grained	]	·	
	_			sand; highly fractured; some organic fragments in	į į	_	•
- 1	لے ا			vertical fractures;	1		
				crumbly; damp.	] !		
				-		7	
}	-					-	
	<b></b> 75 <b></b>				j l	لــ	
					[ ]		·
				75.5-80.5'-Sample.	1 I	•	
				Recovered 4.8/5.0'=96%.	]	-	
	4			RQD 2.3/4.8'=48%.	] !	_	
<b> </b>				SILTSTONE: dark greenish			
				gray (5GY 4/1); some clay	]		
i i	7			and very fine-grained sand; few organics; very	] [		
	-			pale orange (10YR 8/2)	]	-	
				calcareous clay layer at	<b>]</b>		
				77.5'; firm; damp.	<u> </u>		
						7	
					1 <b>1</b>		1
<del></del> -	80						
Rema	rks	Log	ged by:	T. Murphy	Checke	d by:	

Project No.

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Rocky Flats Plant

# LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4

Boring Method - Hollow Stem Auger/NC core Ground Surface Elevation 5931.18

Bori	ng Meth	od · Hollo	w Stem Auger/NC core Ground Su		on 5931.18	
Elev. (feet)	Depth (feet)	Sample Graphic Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content 20 40	Other Tests
	80		80.5-85.5'-Sample.		11111	
			Recovered 4.6/5.0'=92%.			
			RQD 2.7/4.6'=59%.			
	1		SILTSTONE: dark gray (N			
	-		3) to dark greenish gray (5GY 4/1); interbedded			
	-		0.1' to 0.3' beds of sandy		-	
			siltstone; convoluted	· ·	_	
			bedding in places;	1		
	7		occasional clayey siltstone; firm; damp.	1		
	. —		SIICSCOME, IIIm, damp.		_	
	-		85.5-90.5'-Sample.	1	-	
	<b>85</b>		Recovered 5.0/5.0'=100%.			
			RQD 1.4/5.0'=28%. SILTSTONE: dark gray (N		_	l
,	1		3) to dark greenish gray			ł
			(5GY 4/1); interbedded			
	-		sandy siltstone beds (0.5'		_	1
			thick; occasional clayey siltstone layers; organics	ł	_	ł
	L		throughout; calcareous		-	i
	1		concretions from 87.8' to	1		
	1 7		88.4'; firm; damp.	•	_	1
	I →			Ī I	-	1
	I →			į į	_	1
	I _				-	ł
	90					l
	707					
	-				_	1
	-		90.5-95.5'-Sample. Recovered 5.0/5.0'=100%.		·	1
	4		RQD 1.2/5.0'=24%.		<b>-</b>	ł
			SILTSTONE: dark gray (N		_	J
	l 7		3); interbedded sandy	i	_	1
	1 7		siltstone and clayey siltstone beds; sand is			1
	1 -	1	very fine-grained;		-	1
-	1 4		vertical fracture from		-	4
	I _		92.5'-95.5' due to		-	4
	1		<pre>drilling; crumbly; firm; damp.</pre>		_	j
	95_		damp.			l
	<b>-</b> 95		95.5-100.5'-Sample.		·	1
	-		Recovered 4.8/5.0'=96%.	<u>.</u>	-	1
			RQD 3.8/5.0'=76%. SILTSTONE: dark gray (N		-	4
			3); trace very			1
l	7		fine-grained sand		_	
l		<b>3</b>	throughout; some organics;	i	Ī	1
	-		laminated; light olive gray (5Y 6/1) mottling		-	1
	-		around organic fragments;	1	-	1
	ل ا		firm; damp.		-	4
				· <b>1</b>		1
				1		
l	100		,		1 , , , , ,	1
					1100	
Rem	arks	Logged by:	T. Murphy	Check	ed by: Add	
					,	

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

# LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 E 21154.4 Boring Method Hollow Stem Auger/NC core Ground Surface Elevation 5981.18

Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	100			100.5-105.5'-Sample.			
	-			Recovered 5.0/5.0'=100%.		-	
	_			RQD 2.1/5.0'=42%.		-	
				SILTSTONE: dark gray (N			
				<ol> <li>sandy; interbedded silty sandstone beds at</li> </ol>			
1	_			102.6' and 103.8'		-	
				(approximately 0.4'			
				thick). Sandstone layers			
	_			consist of medium gray (N		-	
	_			<ol><li>very fine-grained,</li></ol>		_	
				silty sand; moderately			1
			基章	sorted; convoluted bedding		_	
	-			characteristic of interbedded siltstone and		_	•
	105			sandstone layers; some			ł
	103			calcareous concretions in		·	1
				sandy siltstone layers;	<u>[</u>	_	
	_			\ abundant organics; firm to		-	•
				\hard; damp.		_	
				105.5-110.5'-Sample.			
	_			Recovered 3.2/5.0'=64%.	1	-	1
	_			RQD 1.9/3.2'=59%.		-	ł
		11		SANDSTONE: dark gray (N		_	
	_			<pre>3); very fine-grained; silty; clayey; lower 1.2'</pre>			
	-			of core is clayey		-	1
	_			siltstone; soft to firm;		-	ł
				damp.	]	_	
	_	1		110.5-116.5'-Sample.	7	_	1
	110			/ Recovered 4.6/5.0'=92%.			1
	_			RQD 3.6/4.6'=78%.		-	4
				110.5'-113.3'. SILTSTONE:		_	1
	_	1		<pre>dark gray (N 3); clayey; increasing sand content</pre>		٠ .	1
	-	1		through interval.		<del>-</del>	1
				/113.3'-115.5'. SANDSTONE:	1		1
	_			medium gray (N 5); fine to			1
	-	1		<pre>/ very fine-grained;</pre>		-	1
	<b>-</b>	4 [ ]		occasional clay-filled		-	ď
-	_			vertical fracture; moder-		_	
	_	1		ately sorted; firm; damp.			1
		1		115.5-120.5'-Sample. Recovered 5.0/5.0'=100%.		٠ -	1
	_	4		RQD 4.0/5.0'=80%. 115.5'-	1	-	-1
	115			116.5'. SANDSTONE:		_	
		1		medium gray (N 5); fine to		_	
	-	4		very fine-grained;	1	-	1
	_			<pre>moderately sorted; firm;</pre>			4
				damp. Gradational change			1
	-	1		to siltstone at 116.5'.	_	i -	1
	I –	4	至且	116.5-120.5'. SILTSTONE: darkgray(N3); very			1
		]   [		fine-grained; sandy; some	1		1
	l			clay; well sorted; organic		•	
	I ~	4		fragments in subvertical			1
		4	111	fractures and horizontal		-	4
	<b>l</b>			layers; subvertical frac-	1	_	J
	•			tures have slickensides;	1	Ī	
		4		fractures are 1.0' to 1.5'		<b>.</b>	1
	120			apart.			1
	arks			: T. Murphy	<b>a</b> -1-	ed by:	

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

# LOG OF BORING NO. 23-86

Date Drilled 9/11/86, 9/19/86, 9/22/86, 9/23/86 Coordinates N 37355.0 Hollow Stem Auger/NC core Ground Surface Elevation 5981.18 **Boring Method** 

Bori	ng Method	- Hollow	w Stem Auger/NC core Ground St	urface Elevatio	on 5981.18	
Elev. (feet)	Depth Sen (feet) Ty	pe Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	120 		120.5-125.5'-Sample. Recovered 5.0/5.0'=100%. RQD3.9/5.0'=78%. SILTSTONE: dark gray (N 3) to medium gray (N5); clayey; with interbedded sandy siltstone; sand is fine to very fine-grained; moderately sorted; some organic fragments; slickensides along fracture planes.  125.5-130.5'-Sample. Recovered 4.8/5.0'=96%. RQD 4.2/4.8'=88%. SILTSTONE: dark gray (N 3) to medium gray (N 5); clayey; with occasional interbedded sandy siltstone; occasional light brown (5YR 6/4) calcareous concretions; moderately sorted; firm; damp.			
	135		TOTAL DEPTH: 130.5'			
Rem	arks	Logged by:	T. Murphy	Check	ed by:	
Pro	iect No.					

Project No.

106P06222

Hydro-Search, Inc.

WELL	23-86	

		- 0		WELL CONSTR	PLICTION S	18484	<b>A DV</b>		
				WELL CONSTR	ochola 3	CIALIAI			
			湟	- LOCATION or COORDS:			500	31.18'	
			缰	N 37355.0 E 21154.4	TOP O	F CASIN	3	31.91'	
1	1	-20	緟	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG		
							ART	! FIN	ISH
ĺ			蒫	TOTAL DEPTH Well: 117.00' Hole: 130.50'	TASK		<u>_</u>		
			霆	BOREHOLE DIAMETER <u>0.00' - 32.00': 7½''</u> 32.00' - 130.50': 5 5/8"	DRILLING:	1986	TIME	<u>DATE</u> 1986	TIME
			霆	DRILLER Boyles Brothers Drilling Co.	기상 auger	9/11	1500	9/11	1800
			盨	15865 W. 5th Avenue, Golden, CO	NC core	9/19	1000	9/23	1500
ĺ				(Dave Jarvie)	Reaming	9/26	1217	9/26	1541
			<b>43</b>	RIGMobile B-57	GEOPHYS. LOGGING:				
8				BIT(S) 0.00' - 32.00': T5	CASING:				
١	Murphy	-60 <b>6</b>	<b>建</b> 于	32.00' - 130.50': Carbide bit	5" steel	9/12	1000	9/12	1115
Colden	Ψ			DRILLING FLUID 0.00' - 32.00': None	2" stainless	9/26	<u>1637</u>	9/26	1650
3	H			32.00' - 130.50': air/water mist	FILTER PLACEMENT	0 /26	1738	0/26	2021
	1			SURFACE CASING 5" x 32.50' steel w/ lock-		9/27	0830	<u>9/26</u> 9/27	1037
Z	NEL			WELL DESIGN:	CEMENTING: LEVELOPMENT:	_10/1	1200	10/1	1200
110	ERSONNEL		震	BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
LOCATION	ER			CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	9/26	2021	9/26	2130
ب	۵			0.00' 32.00' C1		9/26	1542	9/26	1545
•					Packer testing	_	_1500_	9/26	1217
		Hod		113.00'- 117.25'_S1_	Cementing 5" steel	9/12	1130	9/12	1225
1	1								
					WELL DEVELOR	MENT			
		<b>∭</b> ≣			See Well Develo	oment S	Summary	Sheet.	
		□20		CASING: CI 5" I.D. steel surface casing					
	J			c2 2" I.D. Sch. 5 type 316 stain-					
	Plan			less steel, threaded and flush				·	
	1 1	-		jointed.				-	
222	Flats	<del>-1</del> 40		screen: Si 2" I.D. Sch 5 type 316 stain- less steel, threaded and flush					
106P06222	3			jointed, 0.010" wire wrap screen,	COMMENTS:				
9	Rocky			0.25' welded bottom cap.	No water encour	ntered o	during o	rilling	; <b>.</b>
				CENTRALIZERS None (see comments)					
		160			Top of stainles	ss stee	casing	g: 0.73	<u> </u>
ECT				FILTER MATERIAL 32-42 silica sand	Built well in	VC words	no cont	ralizor	e used
PROJECT				112.00' - 117.50'	DATTE WEIT III	W LOU.	no cem	Tarrzer	s useu.
<u>o</u>	'			CEMENT Portland Type I	Protective cas				
		_180		0.00' - 111.00'	casing were ber				
		!		OTHER 3/8" bentonite pellets	top of stainle	ss stee	casing	g: 0.08'	•
						<u> </u>			
				117.50 - 150.50					
		200							
				HYDRO-SEARCH SENSORINGS	CONCULTING I	VDD01	001070		001070

106P06222

#### PROBRAM SLUBT, VERSION 4.00T. 1985

THIS PROGRAM CALCULATES MEAN TRANSMISSIVITIES FROM SLUG-TEST DATA BASED ON TWO ANALYTICAL APPROACHES:

- (1) METHOD OF COOPER, BREDEHOEFT AND PAPADDPULOS, 1967 (ARTICLE IN VCL.3,NO.1 OF WRR ENTITLED
  - "RESPONSE OF A FINITE DIAMETER WELL TO AN INSTANTANEOUS CHARGE OF WATER")
- (2) METHOD OF BOUWER AND RICE, 1976 (ARTICLE IN VOL. 12, NO.3 OF WAR ENTITLED "A SLUG TEST FOR DETERMINING HYDRAULIC CONDUCTIVITY OF UNCONFINED AQUIFERS WITH COMPLETELY OR PARTIALLY PENETRATING WELLS")

PROJECT NO.: 6-0118-87

CLIENT: Rockwell International

ITE LOCATION: Rocky Flats Plant

DATE OF SLUG TEST: 2-2-88

FIELD INVESTIGATOR: K. McNeill

WELL NO.: 27-86

INPUT DATA ARE:

INNER CASING DIAMETER = 2.00 INCHES
INNER SCREEN OR OPEN-HOLE DIAMETER = 2.00 INCHES
DIAMETER OF DESILES HOLE = 8 AT INCHES

DIAMETER OF DRILLED HOLE = 5.63 INCHES
-\_ESTIMATED POROSITY OF GRAVEL PACK = .25

LENGTH OF SCREEN OR INTAKE PORTION = 5.50 FEET

DEPTH FROM STATIC LEVEL TO BOTTOM OF SCREEN = 11.70 FEET

THICKNESS OF SATURATED AQUIFER ZONE = 5.50 FEET

FALLING-HEAD INDEX = 0 (\*1\* IF FALLING,\*2\* IF RISING)

NUMBER OF HEAD-TIME DATA POINTS = 13

TIME	HEAD
(sec )	(FEET)
41.00	1.220
51.00	1,220
<del>1</del> 9.00	:,220
F0.00	
127.00	1.220
157.00	1.220
217.00	1,229
537.00	1.220
452.00	1.220
70 <b>2.</b> 00	1.220
342.00	1.229
1942.00	1,215
1342.00	1.210

HO WAS COMPUTED FROM INTERCEPT OF PLOT OF LOSINE VS. FINE

SUDDESSIVE COMPUTED VALUES FOR HI (FEET)

1.2117

### COMPUTED VALUE OF HO = 1.02 FEET

NOTE: TRANSMISSIVITY UNITS ARE IN FT##2/sec AND PERMEABILITY UNITS ARE IN FT/sec

ALPHA	STORATIVITY	- MEAN TRANSMIS- SIVITY	MEAN PERMEA- BILITY	MINIMUM TRANS.	HAXIMUM TRANS.	RATIO OF "T" RANGE TO TBAR	ROOT MEAN SQUARE OF TIME DEVIATIONS	DIFFERENCE IN RMS
1.000E-01	1.000E-01	2.020E-09	3.472E-10	2.343E-10	5.383E-09	2.549700	319.55	.00
1.000E-02	1.000E-02	5.902E-09	1.073E-09	6.741E-10	1.5498-08	2.510021	328.91	-9.36
1.000E-03	1.000E-03	1.682E-09	3.058E-09	1.732E-09	3.97 <b>8E-</b> 08	2.262192	461.62	-132.71
1.000E-04	1.000E-04	3.567E-08	6.485E-99	3.662E-09	8.414E-08	2.256329	465.81	-4.18
1.000E-05	1.000E-05	5.927E-08	1.078E-08	6.230E-09	1.431E-07	2.309766	428.95	36.86
1.000E-95	1.000E-06	8.866E-08	1.612E-08	9.6185-09	2.210E-07	2.384044	383.50	45.44
:.000E-07	1.00 <b>0E-</b> 97	1.196E-07	2.174E-08	1.324E-08	3.042E-07	2.433341	358.19	25.31
1.000E-08	1.000E-08	1.4868-07	2.701E-08	1.660E-08	3.814E-07	2.455973	348.20	9.99
1.000E-09	1.000E-09	1.771E-07	3.221E-08	1.991E-08	4.574E-07	2.469439	342.72	5.48
1.000E-10	1.000E-10	2.059E-07	3.742E-08	2.325E-08	5.343E-07	2.482592	337.30	4.92
-					-			

#### METHOD OF BOUWER AND RICE

COMPUTED RESULTS USING DIAMETER OF OFILLED HOLE:

PERMEARILITY = 7.10E-09 FT/sec = 3.17E-07 OM/sec

TRANSHISS:VITY = [,925-62 FT++1/sec

COMPUTED RESULTS USING DIAMETER OF CASING AND SCREEN:

FERMERBILITY = 9.408-09 FT/sec = 1.868-07 CM/sec

TRANSMISSIVITY = 1,17E+09 FT4#3/sec

WELL NO.: 23-85

IMPET DATA AGE:

INNER CASING DIAMETER = 2.00 INCHES INMER SCREEN IR OPEN-HOLE BLAMETER = 0.00 INCHES CLAMETER OF IPSILED HOLE = 5.65 INCHES

LENSTH OF STREET OR INTEKE PORTION = - ELECTREET CEPTH FROM STATIC LEMEL TO BOTTOM OF SCREEN = 11.70 FEET THICKNESS OF SATURATES ADMIFER CONE = 1,50 FEET

•	7
---	---

TIME	HEAD
(sec	(FEET)
41.00	1.220
51.00	1.220
60.00	1.220
90.00	1.220
127.00	1.220
157.00	1.220
217.00	1.220
337.00	1.220
462.00	1.229
702.00	1.229
942.00	1.220
1042.00	1.210
1342.00	1.210

### HO WAS COMPUTED FROM KNOWN VOLUME OF SLUG

VOLUME OF SLUS ENTERED = .03250 CUBIC FEET

### METHOD OF COOPER, EREDEHOEFT AND PAPADOPULOS

### COMPUTED RESULTS:

### COMPUTED VALUE OF HO = 1.49 FEET

	NOTE:	TRANSMISSIVITY	UNITS ARE IN	FT##2/sac	AND PERMEABIL	.ity Units are in	FT/sec	
ALFHA	STORATIVITY	MEAN TRANSMIS- SIVITY	MEAN PERMEA- BILITY	MINIMUM TRANS.	MAXIMUM TRANS.	RATIO OF STM RANGE TO TEAR	ROOT MEAN SQUARE OF TIME DEVIATIONS	DIFFERENCE IN RMS
1,390E-91 <u> </u>	i.00 <b>0E-</b> 01	2.775E-06	5.046E-07	2.880E-07	8.793E-06	3.064610	513.69	.00
1.000E-01	1.000E-02	8.4092-05	1.5298-06	8.611E-07	2.565E-05	3.066787	514.35	58
1.000E-03	1.00 <b>0E-</b> 03	1.532E-05	2.786E-05	1. <b>559E</b> -08	4.857E-05	3.057929	514.54	28
1.000E-04	1.0008-04	2.227E-05	4.049E-06	2.259E-05	7,0598-05	3.068299	514.66	13
1,000 <b>E-</b> 0E	1.00 <b>0E</b> -05	2.905E-05	5.282E-03	2.942E-05	a.20 <b>8E</b> -05	3.069529	514.73	ûé
1,0005-05	:.00 <b>0E</b> -06	7.570E-05	5. <b>4925</b> -05	7.813E-06	1.1328-04	3,059574	E14.75	04
1.0005-07	1.000 <b>E</b> -67	4.2278-05	7,5952-75	4.275E-06	1.340E-94	7.068767	314.79	02
1 0005-13	1.0005-98	4,8785-05	9.8898-95	4,9318-06	1.5462-04	1.068872	514.81	02
1.000E-09	00 <b>0E-0</b> 9	5.5246-05	1.00 <b>4E</b> -05	5 <b>.58</b> 22 <del>-0</del> 6	1.751E-04	3.08890	514,82	02
1.00 <b>05-</b> 10	1.000E-10	6.186E-05	1,121 <b>5</b> -05	3 <b>. 2305-</b> 96	1,9548-94	3.068927	514.33	01

### PACKER TEST ANALYSIS

WELL NO. 23-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 37.25 - 48.43

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 107.50

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00055508 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 42.84 + 5.00 + 18.16 \* 2.31 = 89.79

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000039 FT/MIN

K = .00000020 CM/SEC

P2/3 TEST

TEST ABORTED, PACKER FAILED

2ND P1/3 TEST

JOB NO. 106P06222 ROCKY FLATS PLANT

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 44.68 - 52.35

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = ---- LN(--)$$
2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 7.67 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.51 + 5.00 + 21.27 \* 2.31 = 102.65

.14 FEET R = BOREHOLE RADIUS =

K = HYDRAULIC CONDUCTIVITY = .00000085 FT/MIN K = .00000043 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00406155 (FEET3/MIN) L = LENGTH OF TEST INTERVAL = 7.67 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.51 + 5.00 + 29.71 \* 2.31 = 122.15

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000279 FT/MIN

K = .00000141 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00009477 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 7.67 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.51 + 5.00 + 21.27 \* 2.31 = 102.65

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN

K = .00000004 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 52.35 - 63.55

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 57.95 + 5.00 + 14.66 \* 2.31 = 96.81

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000009 FT/MIN

K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00255878 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 57.95 + 5.00 + 10.66 \* 2.31 = 87.57

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000183 FT/MIN

K = .00000093 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00023015 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 57.95 + 5.00 + 24.66 \* 2.31 = 119.91

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 66.10 - 77.30

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 107.50

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00033846 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 71.70 + 5.00 + 30.57 \* 2.31 = 147.32

R = BOREHOLE RADIUS = .14 FEET

P2/3 TEST

Q = INJECTION RATE = .00197662 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 71.70 + 5.00 + 43.57 \* 2.31 = 177.35
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN
 K = .00000036 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00004062 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 71.70 + 5.00 + 30.57 \* 2.31 = 147.32
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN<math>K = .00000001 CM/SEC WELL NO. 23-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 67.80 - 79.00
MATERIAL TESTED: ARAPAHOE FORMATION
DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = ----- LN(--)$$
2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00296493 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + 31.30 \* 2.31 = 150.70

R = BOREHOLE RADIUS = .14 FEET

P2/3 TEST

TEST ABORTED

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + 43.90 \* 2.31 = 179.81
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN
K = .00000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.20 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 73.40 + 5.00 + .00 \* 2.31 = 78.40
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN<math>K = .00000000 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 71.80 - 83.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 107.50

K = ----- LN(--)

2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00121847 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 77.40 + 5.00 + 33.02 \* 2.31 = 158.68

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000048 FT/MIN

K = .00000024 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 78.00 - 79.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 107.50

> K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00296493 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 1.00 FEET TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.50 + 5.00 + 31.30 \* 2.31 = 155.80

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000606 FT/MIN

K = .00000308 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 82.72 - 93.92

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

K = ---- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00162462 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 88.32 + 5.00 + 37.72 \* 2.31 = 180.45

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000056 FT/MIN

K = .00000029 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/29/86 BY: T. MURPHY
TEST INTERVAL (FEET BELOW G.S.): 84.05 - 95.25
MATERIAL TESTED: ARAPAHOE FORMATION

DEPTH TO WATER (FEET BELOW G.S.): 107.50

K = - - - - - LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00208493 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.20 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 89.65 + 5.00 + 39.58 \* 2.31 = 186.08

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN

K = .00000036 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 09/23/86 BY: T. MURPHY

TEST INTERVAL (FEET BELOW G.S.): 104.21 - 115.40

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 107.50

$$K = ---- LN(--)$$
2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00043323 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 109.81 + 5.00 + 48.75 \* 2.31 = 227.42

R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

P2/3 TEST

TEST ABORTED, IMPROPER PACKER SEAL

2ND P1/3 TEST

Q = INJECTION RATE = .00102893 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 109.81 + 5.00 + 48.75 \* 2.31 = 227.42

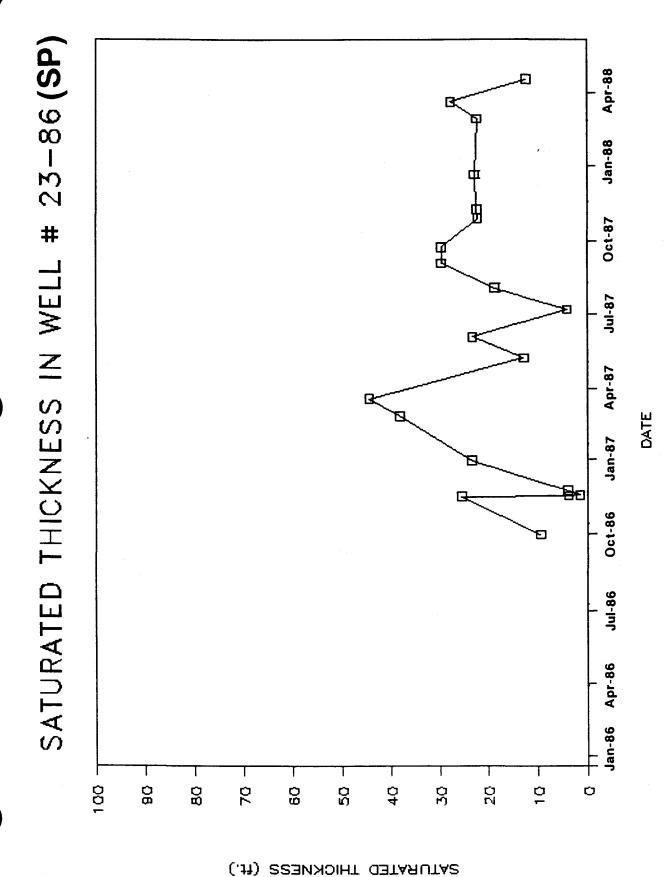
R = BOREHOLE RADIUS = .14 FEET

K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN

K = .00000014 CM/SEC

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2386	10/01/86	5981.18	5981.91	0.73	117.25	107.8	5874.16
	11/17/86					91.79	5890.12
	11/18/86					113.2	5868.66
	11/19/86					115.6	5866.30
	11/25/86					113.2	5868.69
	01/01/87					93.92	5887.99
	02/25/87					79.25	5902.66
	03/18/87					73.00	5908.91
	05/08/87					104.4	5877.53
	06/03/87					94.02	5887.89
	07/08/87					113.0	5868.86
	08/04/87					98.60	5883.31
	09/03/87					87.80	5894.11
	09/23/87					87.80	5894.11
	10/28/87					95.10	5886.81
	11/09/87					94.90	5887.01
	12/21/87					94.50	5887.41
	02/29/88					95.00	5886.91
	03/21/88					89.70	5892.21
	04/18/88					104.9	5877.01



### INDEX OF DATA

Boring No.: 24-86									
Completed as well? Yes									
Data in File									
X Log of Borehole									
X Well Construction Summaries									
Well Development Summaries									
Hydraulic Conductivity Test Data and Results									
Packer Test Data and Results									
X Water Level Data									
X Saturated Thickness Hydrographs									

Rocky Flats Plant

# LOG OF BORING NO. 24-86

Date Drilled 9/12/86

106P06222

Boring Method.

Hollow Stem Auger

Coordinates N 37354.8 E 21172.8 Ground Surface Elevation 5980.45

Bori	ng Method.	Hollo	w Stem Auger Ground Sur	Surface Elevation 5980.45					
Elev. (feet)	Depth Sample (feet) Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests			
	0 -		ARTIFICIAL FILL  0-2.5'-Sample. Recovered 2.0/2.5'=80%. GRAVEL: yellowish gray (5Y 7/2) to light olive gray (5Y 5/2) granitic pebbles and coarse sand; some silt; trace clay; base of sample is grayish brown (5YR 3/2); poorly sorted; soft; dry.  2.5-5.0'-Sample. Recovered 0.9/2.5'=36%. GRAVEL: yellowish gray (5Y 7/2) to light olive gray (5Y 5/2) granite and quartzite pebbles; pale greenish yellow (10Y 8/2) sandy matrix; poorly						
	10 10		sandy matrix; poorly sorted; angular; crumbly; dry.  5.0-7.0'-Sample. Recovered 0.0/2.0'=0%. Large boulder prevented sample recovery.  7.0-12.0'-Sample. Recovered 5.0/5.0'=100%.  7.0-7.2'. GRAVEL: Same as above; dry.		-				
	15		7.2-12.0'. CLAYSTONE: pale olive (10Y 6/2) to greenish gray (5GY 6/1); silty; some fine-grained sand and silty sand stringers at 7.8'; sand is slightly calcareous; claystone contains dark yellowish orange (10YR 6/6) iron staining; calcareous pockets along fractures throughout sample; firm; damp.  TOTAL DEPTH: 12.0'						
Rem	20 - Lo	ogged by	: T. Murphy	Check	ed by:				
Pro	ject No.		Hydro-Search	Inc	Page 1 of 1				

Hydro-Search, Inc.

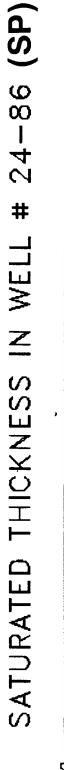
WE		24-86	

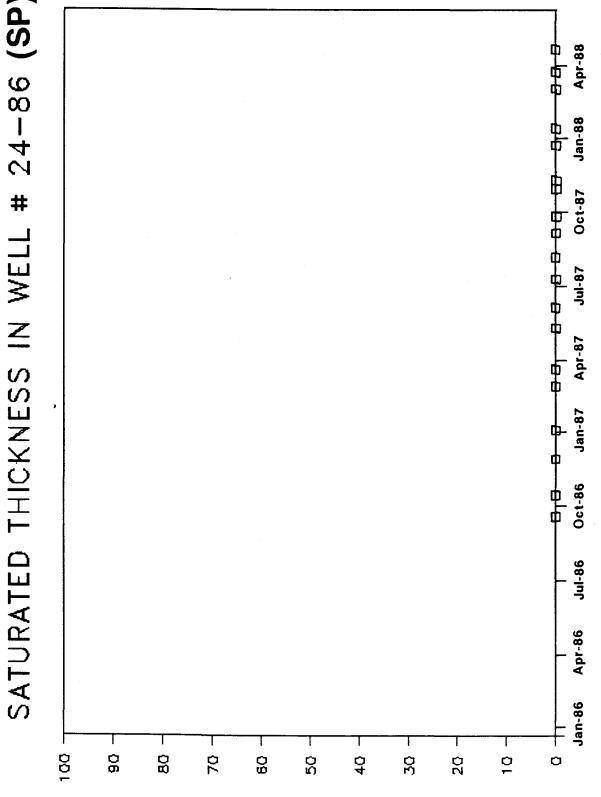
		-0			WELL CONSTR	CUCTION SI	MML	ARY		
				o. Ve	N 37354.8 E 21172.8	ELEVATION: GROUN	ID LEVEL	50	80.45' 82.07'	
1		-2		Vo.V	DRILLING SUMMARY:	CONSTRUCTION			l SIM	
				100 S	TOTAL DEPTH Well: 7.45' Hole: 12.00'  BOREHOLE DIAMETER	TASK	DATE 1986	IME	DATE 1986	TIME
		-4		\$40°	DRILLER Boyles Brothers Drilling Co. 15865 W. 5th Avenue	DRILLING:  7½" auger	9/12	_1320_	9/12	1400
				WOJ.	Golden, CO (Dave Jarvie)  RIGMobile B-57	GEOPHYS. LOGGING:				
en, co	Murphy	_6		0000	DRILLING FLUID None	CASING: 2" stainless	9/12	_1525_	9/12	1526
Colden.	T. M			12: QS	SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT		1526	9/12	1530
NOI	PERSONNEL .	-8			WELL DESIGN:  BASIS: GEOLOGIC LOG _X_ GEOPHYSICAL LOG	CEMENTING: LEVELCPMENT: OTHER:	9/12 9/16	1532 1650	9/12 9/16	1535 1650
LOCATION	PERS(				CASING STRING(S): C=CASING S=SCREEN  0.00' 2.95' C1	Bentonite	9/12 9/12	1530 1520	9/12 9/12	1532 1525
		-10			2.95' - 7.45' SI					
						WELL DEVELO	PMENT			
		-12			CASING: C1 2" I:D. Sch. 5 type 316 stain-	See Well Deve	lopment	Summar	y Sheet.	
					less steel threaded and flush jointed.					
	s Plant	-14			screen: SI 2" I.D. Sch. 5 type 316 stain- less steel, threaded and flush					
106P06222	Rocky Flats				jointed. 0.010"wire wrap screen 0.25' welded bottom cap.	No water enco	untered	i during	g drilli	ng.
		<b>–</b> 16			CENTRALIZERS Type 304 stainless steel 4.34' - 5.59'	Top of stainl	ess ste	eel cas	ing: 1.6	2'
PROJECT					FILTER MATERIAL 32-42 silica sand 2.50' - 7.70'	Cave from TD	to 11.9	90 <b>'</b>		
		-18	<b>,</b>		CEMENT Portland Type I  0.00' - 2.00'  OTHER 3/8" bentonite pellets					
					2.00' - 2.50' 7.70' - 11.90'					
		-20	)		HYDRO-SEARCH RENO*DENVER	CONSULTING H	IYDROI	OGIST	S-GEOL	

### ROCKY FLATS SOLAR PONDS

### WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2486	09/16/86	5980.45	5982.07	1.62	7.25	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/18/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					8.65	5973.42
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/28/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/21/87					-1.00	DRY
	01/11/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					8.70	5973.37





SATURATED THICKNESS (ft.)

DATE

### INDEX OF DATA

Boring No.: 25-86						
Completed as well? Yes						
Data in File						
X Log of Borehole						
X Well Construction Summaries						
Well Development Summaries						
X Hydraulic Conductivity Test Data and Results						
X Packer Test Data and Results						
X Water Level Data						
_x_ Saturated Thickness Hydrographs						

LOG OF BORING NO. Project: Rocky Flats Plant 25-86 Coordinates N 37426.3 E 21726.5 Date Drilled 9/13/86 - 9/17/86 Boring Method NC Core **Ground Surface Elevation** 5974.45 Penetration Resistance Other Depth Semple Graphic (feet) Type Log Elev. Tests Material Description (Blows/Inch) 20 20 40 ARTIFICIAL FILL 2000 0-2.0'-Cuttings. GRAVEL: granite and quartzite pebbles and large cobbles; 2.0-9.0'-Cuttings. GRAVEL: pale yellowish brown (10YR 6/2); clayey; some silt and sand; 50% fines; dry to slightly 0.000 0.000 0.000 damp. 9.0-11.0'-Cuttings. CLAY: gray orange (10YR 7/4); sandy and silty; caliche 000 stringers; 1-2% quartzite pebbles; damp. 11.0-13.0'-Cuttings. CLAY: gray orange (10YR 7/2); gravelly; silty; 20% quartzite pebbles; caliche stringers; damp. 13.0-17.0'-Cuttings. CLAY: Same as above; light olive brown (5Y 5/6); damp. ARAPAHOE FORMATION 17.0-19.5'-Cuttings. CLAYSTONE: moderate yellowish brown (10YR 5/4); sub-plastic; damp. 19.5-20.0'-Cuttings. CLAYSTONE: grayish brown (5YR 3/2); plastic; moist. Checked by: Remarks Logged by: T. Gulliver & T. Murphy Project No. Hydro-Search, Inc.

106P06222

Page 1 of 5

LOG OF BORING NO. Project: Rocky Flats Plant 25-86 Coordinates N 37426.3 E 21726.5 Date Drilled 9/13/86 - 9/17/86 Ground Surface Elevation 5974.45 Boring Method NC Core Penetration Resistance Other Depth Sende Graphic (feet) Type Log Elev. (feet) Tests Material Description (Blows/Inch) 20 40 20 20.0-22.0'-Cuttings. CLAYSTONE: light grayish brown (5YR 6/1); firm; damp. 22.0-37.0'-Cuttings. CLAYSTONE: light grayish brown (5YR 6/1); silty; very wet (cored with water). 35 -37.0-41.6'-Sample. Recovered 0.0/4.6'=0%.

Remarks

Logged by: T. Gulliver & T. Murphy

Checked by:

Project No.

40

Hydro-Search, Inc.

Page 2 of 5

LOG OF BORING NO. Project: Rocky Flats Plant 25-86 Coordinates N 37426.3 E 21726.5 9/13/86 - 9/17/86 **Date Drilled** Ground Surface Elevation 5974.45 NC Core Boring Method Penetration Resistance Other Depth Semple Graphic (feet) Type Log Elev. Tests **Material Description** (Blows/Inch) 20 40 41.6-46.6'-Sample. Recovered 5.0/5.0'=100%. RQD 3.0/5.0'=60%. CLAYSTONE: light olive gray (5Y 5/2) to olive gray (5Y 3/2); light brown to dark yellowish orange (10YR 6/6) iron staining; trace silt; ironstone; altered claystone concretions from 46.0-46.6'; firm; damp. 46.6-51.6'-Sample. Recovered 5.0/5.0'=100%. ROD 3.6/5.0'=72%. CLAYSTONE: light brown (10YR 6/6) grading to medium dark gray (N 4); ironstone from 46.6-47.0'; heavy iron staining at 48.0; high angle fractures with calcite along fracture planes; firm; moist. 51.6-56.6'-Sample. Recovered 5.0/5.0'=100%. RQD 4.3/5.0'=86%. CLAYSTONE: grayish black (N2) to dark gray (N3); occasional dark yellowish orange (10YR 6/6) iron staining; some coaly layers and fragments; firm; damp. 56.6-61.6'-Sample. Recoverd 5.5/5.0'=100%. RQD 3.5/5.0'=57%. CLAYSTONE: grayish black (N 2); silty; organic wood fragments; fractures due to drilling; firm; damp.

Remarks

Logged by: T. Gulliver & T. Murphy

Checked by:\_

Project No.

106P06222

Hydro-Search, Inc.

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Project:

Rocky Flats Plant

# LOG OF BORING NO.

25-86

Date Drilled

9/13/86 - 9/17/86

loring Method NC Core

Goordinates N 37426.3 E 21726.5 Ground Surface Elevation 5974.45

Boring Method NC Core			NC Core	Ground Surface Elevation 5974.45							
Elev. (feet)			Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Containt 20 40	Other Tests				
	60			61.6-66.6'-Sample. Recovered 4.0/5.0'=80%. RQD3.4/4.0'=92%. CLAYSTONE: light olive gray (5Y 5/2); silty; occasional very fine-grained sandstone laminations at 63.5'; cal- careous at 63.0'; hard; dry to damp.  66.6-71.6'-Sample. Recovered 5.0/5.0'=100%. RQD5.0/5.0'=100%. CLAYSTONE: grayish black (N 3); thin interbedded silty claystone and clayey siltstone; highly fractured with numerous subvertical slickensides; crumbly to firm; damp.							
	75—			71.6-74.0'-Sample. Recovered 0.0/2.4'=0%.  74.0-79.0'-Sample. Recovered 5.0/5.0'=100%. RQD 4.2/5.0'=85%. SANDSTONE: dark greenish gray (5GY 4/1); very fine-grained; silty; some clay; laminations of siltstone; convoluted bedding; moderately sorted; firm; damp.  79.0-81.1'-Sample. Recovered 2.1/2.1'=100%. RQD 1.3/2.1'=62%. SANDSTONE: Same as above; damp.			100				
Rema			Logged	by: T. Gulliver & T. Murphy		Checked b	ov: Jef				

Remarks

Logged by: T. Gulliver & T. Murphy

Checked by:

Project No. 106P06222

Hydro-Search, Inc.

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LOG OF BORING NO. Project: Rocky Flats Plant 25-86 Coordinates N 37426.3 E 21726.5 Date Drilled 9/13/86 - 9/17/86 Ground Surface Elevation 5974.45 Boring Method NC Core Penetration Resistance Other Elev. Depth Sample Graphic (feet) (feet) Type Log Tests Material Description (Blows/Inch) 20 40 20 81.1-82.6'-Sample. Recovered 1.3/1.5'=87%. RQD 0.6/1.3 =46%. SANDSTONE: Same as above; some black coal lenses; firm; damp. 82.6-85.6'-Sample. Recovered 3.0/3.2'=94%. RQD 1.3/3.0'=43%. SILTSTONE: grayish black (N 3); alternating laminations of very fine-grained sandy siltstone and clayey siltstone; very fine coaly lenses; thinly bedded; some convoluted bedding; firm; dry to damp. 85.5-89.8'-Sample. Recovered 2.4/4.2'=57%. RQD 0.0/2.4'=0%. SILTSTONE: Same as above; dry to damp. TOTAL DEPTH: 89.8'

**Remarks** 

Logged by: T. Gulliver & T. Murphy

Checked by: '

Project No.

106P06222

Hydro-Search, Inc.

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WELL	25-86
7 2 1	

		-0		E o	WELL CONSTR	CUCTION S	UMM	ARY		
				0.0	N 37426.3 E 21726.5	ELEVATION: GROUN	D LEVEL	<u>59</u>	74.45' 76.55'	
1	,	<b>-1</b> 0			DRILLING SUMMARY:	CONSTRUCTION				
								ART	FIN	ISH
					TOTAL DEPTH Well: 82.00' Hole: 89.80'  BOREHOLE DIAMETER 0.00' - 38.50': 7½"	TASK	<u>DATE</u> 1986	TIME	DATE 1986	TIME
		20			38.50' - 89.80': 3 3/4"  DRILLER Boyles Brothers Drilling Co.	DRILLING: 건성" auger	8/26	1401	8/27	1330
		20			15865 W. 5th Avenue	NC core	9/13	1400	9/16	1700
					Golden, CO (Dave Jarvie)	Reaming	9/17	1030	9/17	1315
				<b>%</b> =	RIG Mobile B-57	GEOPHYS. LOGGING:			_	
					BIT(S) 0.00' - 38.56': Blade bit; 38.56' -	CASING:				
8	λγ				89.80': Carbide bit	5" steel	8/27	1353	8/27	1421
©lden,	. Murphy	<del> 3</del> 0			DRILLING FLUID 0.00' - 38.50': None: 38.50' - 89.80': air/water mist	2" stainless	9/17	1537	9/17	1545
व					SURFACE CASING 5" x41' steel w/ locking	FILTER PLACEMENT	9/17	1526	9/17	1804
	-				cap Surface Casing 2 X41 Seet W/ Tocking	1	9/18	0904	9/18	1010
-	重	,,		<b>%</b> =	WELL DESIGN:	CEMENTING:	9/30	1430	10/1	0945
LOCATION	ERSONNEL	40			BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
S	R S				CASING STRING(S): C=CASING S=SCREEN	Bentonite	9/17	1805	9/17	1816
2	PE				0.00' 38.50' C1		9/17	1505	9/17	1506
					0.00'- 59.90' C2 -	Cementing 5"	8/27	1540	8/27	1606
		L50			59.90'- 82.00' S1	steel				
- 1								1	1	
						WELL DEVELO	PMENT			
	1					See Well Devel	opment	Summary	Sheet	
	1	_60								
					CASING: CI 5" I.D. steel surface casing					
					c2 2" I.D. Sch. 5 type 316 stain-					
	aut	1		==	less steel, threaded and flush					
				<b> </b>	jointed.			· · · · · · · · · · · · · · · · · · ·	-	····
7	Flats	<u>L</u> 70	=		SCREEN: SI 2" I.D. Sch. 5 type 316 stain-				·	<del></del>
106P06222				-	less steel, threaded and flush	COMMENTS:				
26	Rocky	1		=	jointed, 0.010" wire wrap screen,	į				
=	2	1	∭≣		0.25' welded bottom cap.	No water encou	mtered	during	drillin	g
- 1					CENTRALIZERS None (see comments)					
		-80				Top of stainle	ess stee	el casir	g: 2.10	)'
PROJECT			HOSEDESI		FILTER MATERIAL 32-42 silica sand	Cave from TD	to 84.60	)'		
8		İ			66.10' - 83.60'					<del></del> :
•	•				CEMENT Portland Type I					
		L <sub>90</sub>			0.00' - 64.00'					
					OTHER 3/8" bentonite pellets					
					64.00' - 66.10'					
					83.60' - 84.60'					
				İ						
		-10	0		HYDRO-SEARCH RENO-DENVER	CONSULTING F	HYDROL	OGIST	S-GEOL	.OGISTS



CLIENT/SUBJECT	W.O. NO						
TASK DESCRIPTION	<del></del>	TASK NO					
PREPARED BY	DEPT	DATE	AP	PROVED BY			
MATH CHECK BY METHOD REV. BY			DEPT	DATE			
	WEL	125-86					
Hydraulic	Conductivity	(cm/sec)=	7 x 10-8				
Flowrate	(gpm) =	0.0593 gpm					
<u></u>							

Screened Interval (It below G.L.) = 59,9-82,00° 59,9-71,6 claystone 71,6-74,0 missing core 74,0-82,0 sandstone

Method of Analysis: Residual - drawdown Plot

(Driscoll, 1986 - pg 256.)



CLIENT/SUBJECT \_\_\_\_\_\_ W.O. NO.\_\_\_\_\_

TASK DESCRIPTION \_\_\_\_\_\_ TASK NO.\_\_\_\_

PREPARED BY \_\_\_\_\_\_ DEPT\_\_\_\_\_ DATE\_\_\_\_\_ APPROVED BY

MATH CHECK BY \_\_\_\_\_\_ DEPT \_\_\_\_ DATE \_\_\_\_\_ DEPT \_\_\_\_ DATE \_\_\_\_\_

WELL 25-86

$$T (qpd/ft) = \frac{264Q}{25'} = \frac{(264)(0.0593)}{451} = 3.47 \times 10^{-2}$$

$$K(qpd/ft^2) = T/b = 3.47 \times 10^{-2}/22.1 = 1.57 \times 10^{-3}$$

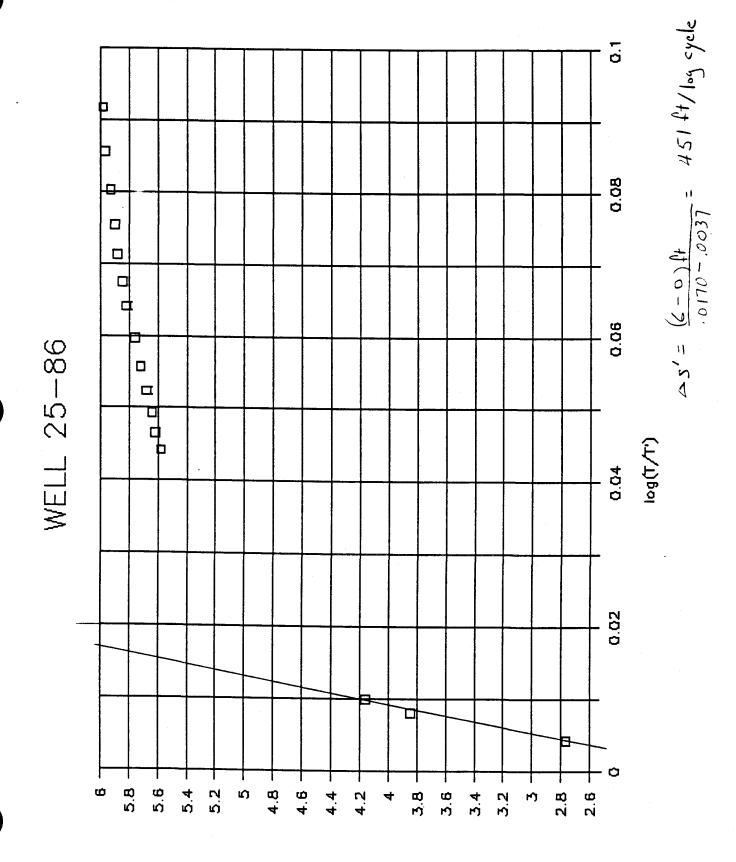
This method is valid where us o.o.

solving for t for u < 0.01.

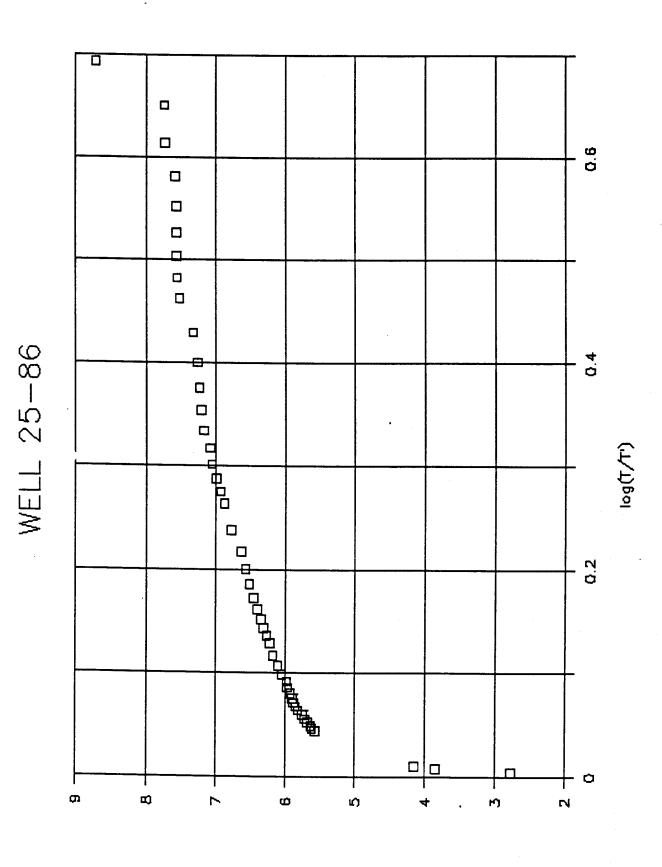
$$t(min) = \frac{rz}{4Tu} = \frac{(0.156)^2 (0^{-3})}{4 (3.47 \times 10^{-2}) (0.01)} \times \frac{1440 min}{4 ny} \times \frac{7.482 cal}{672}$$

where 
$$r(ft) = \frac{3.75}{24} ft = (0.156) ft$$

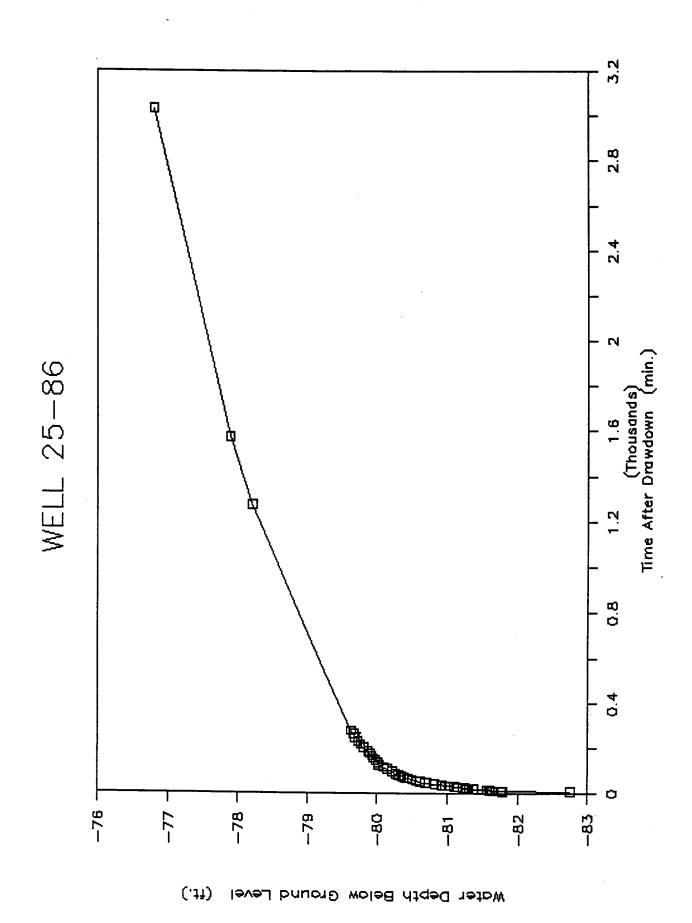
 $S = 10^{-3}$  assumed S for confined aquifer AS is based on points where  $t \ge 1303$  min.



Residual Drawdown (ff.)



Residual Drawdown (ft.)



	•				
	w	ELL 25-86			
T	T *	Water	s¹	log(T/T')	
Time	T Prime	Level Rs	sd Drwdn		
(min.)	(min.)	(ft.)	(ft.)		
37.00	7.50	82.75	8.71	0.69	
38.00	8.50	81.78	7.74	0.65	
39.00	9.50	81.77	7.73	0.61	
40.00	10.50	81.63	7.59	0.58	
41.00	11.50	81.61	7.57	0.55	
42.00	12.50	81.61	7.57	0.53	
43.00 44.00	13.50 14.50	81.61 81.60	7.57 7.56	0.50 0.48	
45.00	15.50	81.57	7.53	0.46	
47.00	17.50	81.37	7.33	0.43	
49.00	19.50	81.30	7.26	0.40	
51.00	21.50	81.28	7.24	0.38	
53.00	23.50	81.25	7.21	0.35	
55.00	25.50	81.22	7.18	0.33	
57.00	27.50	81.13	7.09	0.32	
59.00	29.50	81.10	7.06	0.30	
61.00	31.50	81.03	6.99	0.29	
63.00 65.00	33.50	80.97	6.93	0.27	
70.00	35.50 40.50	80.92 80.82	6.88 6.78	0.26 0.24	
75.00	45.50	80.68	6.64	0.22	
80.00	50.50	80.61	6.57	0.20	
85.00	55.50	80.56	6.52	0.19	
90.00	60.50	80.49	6.45	0.17	
95.00	65.50	80.44	6.40	0.16	
100.00	70.50	80.39	6.35	0.15	
105.00	75.50	80.35	6.31	0.14	
110.00	80.50	80.31	6.27	0.14	
115.00 125.00	85.50 95.50	80.26	6.22	0.13	
135.00	105.50	80.22 80.14	6.18	0.12 0.11	
145.00	115.50	80.09	6.10 6.05	0.10	
155.00	125.50	80.02	5.98	0.09	
165.00	135.50	80.01	5.97	0.09	
175.00	145.50	79.97	5.93	0.08	
185.00	155.50	79.94	5.90	0.08	
195.00	165.50	79.92	5.88	0.07	
205.00	175.50	79.89	5.85	0.07	
215.00	185.50	79.86	5.82	0.06	
230.00	200.50	79.80	5.76	0.06	
245.00	215.50	79.76	5.72	0.06	
260.00 275.00	230.50 245.50	79.72 79.68	5.68	0.05	
290.00	260.50	79.68	5.64 5.62	0.05 0.05	
305.00	275.50	79.62	5.58	0.04	
1303.00	1273.50	78.20	4.16	0.01	
1602.00	1572.50	77.89	3.85	0.01	
3061.00	3031.50	76.81	2.77	0.00	

### AQUIFFR TEST DATA

AQUIPER 1231 L		w observation we
TYPE OF AQUIFER TEST BAN DOWN BOR, TOUT	PUMPING	RECOVERY DATA
HOW O MEASURED 4 Gar Bucker	PAGE	OF_Z
HOW W.L.'s MEASURED	DEPTH OF PUMP/AIRPIPE PUMP ON: date	time
RAD. / DIST. OF/FROM PUMPING WELL	PUMP OFF: date 11-12-86	time N:04:30
MEAS. POINT FOR W.L.'s	DURATION OF ACUIFER TEST	••

	t=	TIM	IE _ at t'	= 0	WATER LEVEL DATA STATIC WATER LEVEL 15+64 (NOT AND)					DISCH	ARGE	OROED	COMMENT
04		Ł	1'		READING	CONVENSION	-WATER	s or s'		READ-	Q	REC	7.0, 84.40 gm
_	11:05					150	À						M:15c-571/4000
1	1005/2				MC 770		1						11:01:30 FINBU
H	H306 ·				A 10								A7590- NAT. B
$\vdash$	IK 061/2				PQ 13D								
$\vdash$	11:07				PL HO							'	Wh = 45+
	11.074				METO							1	mall= 1,35
Г	11:09:1				INTO	·						1	
	(100%				NTD			~				Y	
	1109				ULTO		.,			•		1	500
	NO 1/2				MTO					1. 7	CHON	水子	Obes 16.
	INDO	5.0			NETTO		· ·			1		7	·
	1110/2												4
	ill.	6.0			80113:40		2 -		•				
Г	1112	17			PO142		82:15	8.71				CW	
一	_	1			ROHLA!		81.78	7.74				a	
		. 9			60+3A	7 1	.21.77	7.73				CW	
	1115	10			90+313	,	8463	7.59				~	
	1116	11			80+3.11		8141	7.57				*	
F	1117	12			80+3.11		8661	7.51				·	
-	1118.	13			80+311		8/.61	7.57				•	
Г	1119	14			8013.10		81.60	7.56				-	
Г	11120				80x307		81.57	7.53					
Г	1172	17			801-2.87		8437	7.33				Con	
Γ	1124	19			801 2.80		81.30	7.26				1B	
Г	176	21			80+ 1.18		81.28	7.24		1			
Γ	128	23			20+ 2.18	,	81.25	7.21					
Γ	1130	25			80+ 2.72		81.22	7.19					
Γ	132	27			80 + 2.63		81.13	7.09					
Γ	1134	29			80+2.60		91.10	7.06			2		
Γ	1136	3/			60+253		24.03	6.99					
Г	1158	33			20+2.47		80.97	6.93					
Γ	1140	35			80+242	1	80.92	6.88					
	1145	30			80+ 2.52		80.62	6.78					
	110	er			804 2.10		80.68	6.64					
	1155	50			804 2.11		80.61	6.57					
Г	1200	5			80+ 2.06		80.56	6.52					
Г	1205	60			80+ 1.29		80.49	6.45					
	1215	65			8: 4 1.24		80,44	6.40					
	125	70			804 1.83		20,39	6.35					
	1220	75			80+1.85		20, 35	6.3/					
	1285	80	1		80+181		80.31	6.27					

HYDRO-SEARCH

RENO . DENVER

CONSULTING HYDROLOGISTS-GEOLOGIST

WELL_	25-86
PUMPING (	OBSERVATION WELL
PUMPING	PRECOVERY DATA
PAGE	OF
RPIPE	

		HO	W Q ME	ASURED	TEST	Ban!	Ome Rese 4 gra Bu Strupe	v. TEST CCCT		PUMPING OF OBSERVATION WEL  PUMPING OF PECOVERY DATA  PAGE OF  DEPTH OF PUMP/AIRPIPE					
		RΔ	D. /DIST	OF/FRO	M PUM	PING W	ELL				: date_				me
											: date				me
			EVATION							DURATION OF AQUIFER TEST					
		TIME t= at t'= o				WATER LEVEL DA' STATIC WATER LEVEL75_54				DISC	HARGE	ORDED	COMMENT		
		DA	CLOCK TIME	Ł	t'		READING	CONVERSIONS	WATER	s or s'		READ-	a ··	REC	
			175.0	85			8011.76		8026	6.22				13	
		П	1240	95			BOILTZ	Y	80,22	6.18				1	
		Г	1250	105			80 +1.64		80.4	60					
			1300	115			80+150		80.09	6.05				П	
			1310	125			80+1.52	1	50.08	5.98					
			1370				90 21.51		80.01	5.97					
			1273				904 1.47		79.97	573				П	
		Г	1-40	155		1	90+1.44		79.94	590					
		Г	1350	165			80+1.42		79.92	5.98				7	
		Г	1400	177			80+1.39		79.89	5.35				7	
	ني		1410	155			00 + 1.36		79.86	5.82		1		A	
NO.	PERSONNEL		H25	200			80130		79-80	5.76					
LOCATION	S		M40	215			80+ 1.26		79.76	5.72					
Ö	Ä	Г	1455	230			80+122		79.72	5. 68					
_		7	1510				80+1.18		72.68	5.64					
		7	1525				80+/.16		79.66	5. 6Z					
		1	1540	275			80 × 1.12		79.62	5.58					
1	1													1	
		2	8.78				15+4.70		78.ZO	4.16					
			13:17				75+439		75.25	3.85					
		_	13:36				75+3.31			2.77	90%				
			8:46				5+0.31								
			15:27				15+0-15								
	1	7	8:22				704.96								
		7													
		$\vdash$					/								
		П					/								
		П													
				-					·						
		П													
		П	-												
		П						<del>.,</del>						$\dashv$	
<u> </u>		П											1	$\neg$	
PROJECT		П	,												
8		П											<del></del>	$\dashv$	
α,	•	$\vdash$					<del>                                     </del>								

HYDRO-SEARCH

RENO - DENVER

CONSULTING HYDROLOGISTS-GEOLOGIS

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/06/86 BY: T. GULLIVER
TEST INTERVAL (FEET BELOW G.S.): 35.88 - 47.06

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = ----- LN(--)$$
  
2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00128193 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.47 + 9.00 + .00 \* 2.31 = 50.47

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000153 FT/MIN

K = .00000078 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00407424 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.47 + 5.33 + 5.00 \* 2.31 = 58.35

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000421 FT/MIN

K = .00000214 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00050092 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.47 + 6.87 + .00 \* 2.31 = 48.34

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000063 FT/MIN

K = .00000032 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/06/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 48.05 - 59.23

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = ----- LN(--)$$
  
2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00001692 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 53.64 + 10.70 + .00 \* 2.31 = 64.34

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00005802 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 53.64 + 5.33 + 10.30 \* 2.31 = 82.76

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN

K = .00000002 CM/SEC

2ND P1/3 TEST

TEST ABORTED

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/06/86 BY: T. GULLIVER

TEST INTERVAL (FEET BELOW G.S.): 58.86 - 70.04

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = ----- LN(--)$$
  
2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00005802 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.45 + 10.84 + .00 \* 2.31 = 75.29

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00187212 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.45 + 5.33 + 12.00 \* 2.31 = 97.50

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000116 FT/MIN

K = .00000059 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00078693 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.45 + 8.69 + .00 \* 2.31 = 73.14

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000065 FT/MIN

K = .00000033 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/06/86 BY: T. GULLIVER TEST INTERVAL (FEET BELOW G.S.): 69.36 - 80.54

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = ---- LN(--)$$
2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00006092 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.95 + 10.67 + .00 \* 2.31 = 85.62

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00993387 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.95 + 5.33 + 15.00 \* 2.31 = 114.93

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000521 FT/MIN

K = .00000265 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00213231 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.95 + 10.06 + .00 \* 2.31 = 85.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000151 FT/MIN

K = .00000077 CM/SEC

### PACKER TEST ANALYSIS

WELL NO. 25-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/06/86 BY: T. GULLIVER TEST INTERVAL (FEET BELOW G.S.): 83.29 - 94.47

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 69.92

$$K = ----- LN(--)$$
2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00038077 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 69.92 + 10.60 + .00 \* 2.31 = 80.52

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000029 FT/MIN

K = .00000014 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00782772 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 69.92 + 5.33 + 18.90 \* 2.31 = 118.91

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000397 FT/MIN

K = .00000202 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00811115 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.18 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 69.92 + 10.20 + .00 \* 2.31 = 80.12

R = BOREHOLE RADIUS = .16 FEET

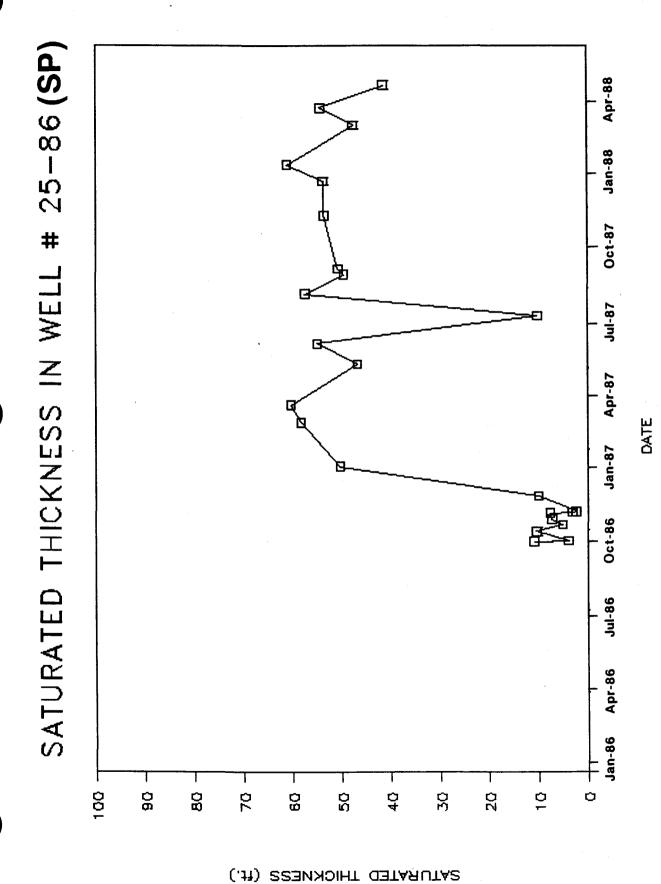
K = HYDRAULIC CONDUCTIVITY = .00000611 FT/MIN

K = .00000310 CM/SEC

### ROCKY FLATS SOLAR PONDS

### WATER LEVEL SUMMARY

WELL		GROUND	TOP OF		DEPTH	WATER	WATER
		SURFACE	CASING	STICK	OF SI	DEPTH	SURFACE
NUMBER	DATE	ELEVATION	ELEVATION	UP	BASE	BELOW TOC	ELEVATION
2586	00/70/0/	507/ /5				74 05	5005 50
2700	09/30/86	5974.45	5976.55	2.10	82.00	71.05	5905.50
	10/01/86					77.93	5898.62
	10/13/86					71.42	5905.13
	10/21/86					76. <i>7</i> 3	5899.82
	10/28/86					74.59	5901.96
	11/05/86					74.24	5902.31
	11/06/86					78.65	5897.90
	11/07/86					79.52	5897.03
	11/26/86					71.94	5904.61
	01/01/87					31.83	5944.72
	02/25/87					23.92	5952.63
	03/18/87					21.75	5954.80
	05/08/87					35.38	5941.17
	06/03/87					27.25	5949.30
	07/08/87					71.70	5904.85
	08/04/87					24.70	5951.85
	08/27/87					32.60	5943.95
	09/03/87					31.40	5945.15
	11/09/87		, ,			28.60	5947.95
	12/21/87					28.40	5948.15
	01/11/88					21.00	5955.55
	02/29/88					34.60	5941.95
	03/21/88					27.80	5948. <i>7</i> 5
	04/18/88					40.70	5935.85



### INDEX OF DATA

Boring No.: 26-86					
Completed as well? Yes					
Data in File					
X Log of Borehole					
X Well Construction Summaries					
Well Development Summaries					
X Hydraulic Conductivity Test Data and Results					
Packer Test Data and Results					
X Water Level Data					
X Saturated Thickness Hydrographs					

Project:

Project No.

106P06222

Rocky Flats Plant

# LOG OF BORING NO.

Date Drilled

**Boring Method** 

8/22/86

Hollow Stem Auger

Coordinates N 37425.8 E 21737.2 Ground Surface Elevation 5974 48

26-86

Page 1 of 2

		····	HOI	low Stem Auger Ground S	surface Elevation 5974.48					
Elev. (feet)		Sěmpla Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests			
	0		8°0.	ARTIFICIAL FILL						
			20.0	0-1.5'-Sample. Recovered						
			و در	1.3/1.5'=87%. GRAVEL:		-				
		/ / J	00	light brown (5YR 6/4)		_				
	_	V/I	000	granite and quartzite						
	لے ا	I/J	50.9	pebbles and cobbles;						
		/ / J	500°C	<pre>sandy; poorly sorted; angular to subangular;</pre>		-				
		V/I		dry.	Į i	-				
I	-		500	-		_	ļ			
l			2.0	1.5-4.0'-Sample.						
•			59	Recovered 0/2.5'=0%.		-				
l			1000	4 0 7 01 0		-				
ł	2.5		(.0%)	4.0-7.0'-Sample.	l i					
				Recovered 2.6/3.0'=87%.						
ł			000	4.0-4.5'. Same as above;		1				
		<b>/</b> / <i>}</i>	000	dry.		-				
	-		00			_				
	_			4.5-7.0'. SAND: very						
		/ 1	( <u>)</u>	pale orange (10YR 8/2) to						
	7	/ / [	385	grayish orange (10YR 7/4); very coarse to fine-						
I	-	/ /	0 0 0	grained; some granite and		_				
ı	4	/ / F	005	quartzite pebbles and						
I		/ <u>/</u> ŧ	000	cobbles; silty; grades						
í		//		into dark yellow orange	1	7				
j	4	//		(10YR 6/6) sand at base of		-				
ŀ	<b></b> 5 <b></b> -€	/ /		<pre>sample; bedding apparent due to size variation;</pre>	1	_	·			
1				poorly sorted; subangular	j i					
	7	//		to angular; damp.		=				
		/ /		_	]					
	{	/ }		7.0-9.0'-Sample.	j i					
į		//		Recovered 0.0/2.0'=0%.	1					
I		//		9.0-12.0'-Sample.	1					
1	7	//		Recovered 3.0/3.0'=100%.	1					
1	1	/ /			1					
-1				9.0-9.5'. Same as above;	1 1	. 1				
- 1	ŀ			damp.	1 1					
j		//			1	-				
- 1					1	-4				
-	<b>-</b> 7.5	/ /			7 I					
•				ARAPAHOE FORMATION	1	7				
1	7			9 5-12 01 073 4070						
	4	/ 1		9.5-12.0'. CLAYSTONE: light olive brown (5Y	1	-4				
	∤	//		5/6); some silt; trace	1					
ı		/ /		sand; sand layers from	}					
1	T			10.4-10.7' and 11.4-11.6':	1	7				
	7	/ /		sand is very pale orange	j i					
•				(10YR 8/2); coarse-	1 1	4	1			
	1	/ /		<pre>grained; moderately sorted; subangular; trace</pre>	1					
				calcareous cement;	1	$\vee$ 7				
1				unconsolidated; soft; wet;	1 F	<del></del>				
1	10	F		clay is firm; moist.	1					
L			1							
Remar	rks	Los	gged hv	T. Murphy	Checke	ed by:				
			20-4 U	· · · · · · · · · · · · · · · · · ·	- Glecki	- 17 - X - X - X - X - X - X - X - X - X -				

Hydro-Search, Inc.

LOG OF BORING NO. Project: Rocky Flats Plant 26-86 Coordinates N 37425.8 E 21737.2 Date Drilled 8/22/86

Bori	ng Met	hod	Holl	low Stem Auger Ground Su	rface Elevation		
Elev. (feet)	Depth (feet)	Semple Cri	achic .00	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	10   1   1   1   1   1   1   1   1   1			12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: medium dark gray (N 4) with grayish orange (10YR 7/4) and pale olive (10YR 6/2) mottling; some silt with very coarse-grained sand lenses less than 0.2' thick; ironstone layer at 12.9-13.2' with calcareous cement; firm; moist.			
Rems	arks	ಡಿತಿರು	ged by	: T. Murphy	Chec	ked by:	
Proje	ect No.			Hydro-Soarch	ln -		

106P06222

Hydro-Search, Inc.

Page 2 of 2

	24.04	
WELL	26 <b>-8</b> 6	

,		-0			1	20	WELL CONSTR	UCTION SI	UMM	ARY		
						020	LOCATION or COORDS:		ID LEVEL	50	74.48' 76.49'	
1	ı	<b>-</b> 2				7	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
					ŀ	4	TOTAL DEPTH Well: 11.00' Hole: 17.00'			ART	FIN	ISH
						100	BOREHOLE DIAMETER	TASK DRILLING:	<u>DATE</u> 1986	TIME	<u>DATE</u> 1986	TIME
		<b>-</b> 4				2,0	DRILLER Boyles Brothers Drilling Co. 15865 W. 5th Avenue	7년' auger	8/22	1235	8/22	1400
				≣			Golden, CO (Dave Jarvie)					
							RIG Mobile B-57	GEOPHYS. LOGGING:				
8	2			≣			BIT(S)Blade bit	CASING: 2" stainless	8/22	1555	8/22	1556
Colden	Murphy	<b>–</b> 6					DRILLING FLUID None	2 Scarriess				
ğ	1				N		SURFACE CASING 5" x 5' steel w/ locking	FILTER PLACEMENT:	8/22	1556	8/22	1504
	ا			≣		1	cap	CEMENTING:	8/22	1607	8/22	1611
NO.	ERSONNEL	8					WELL DESIGN:	CEVELOPMENT:	9/12	14 15	9/17	1110
ATI	1051						BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
LOCATION	PER						CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	8/22	1604	8/22	1602
							0.00' 3.75' Cl		8/22	1550	8/22	1555
		10				=			<del></del>			
		٦			E	킄						
1				≣		3						
				لبا	E	3		WELL DEVELOR	PMENT			
l						=						
		12			F	긬		See Well Devel	opment	Summary	Sheet.	
1					ı	3	CASING: C1 2" I.D. Sch. 5 type 316 stain-					
					Œ	$\exists$	less steel threaded and flush					
	lant					킄	jointed.					
	s Pl					=					-	
77	at	14				4	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-			<u> </u>		
98	Y FI					3	<u>less steel, threaded and flush</u> <u>jointed, 0.010" wire wrap screen</u>	COMMENTS:				
106P06222	Rocky					=	0.25' welded bottom cap.	Water encounter	rod at (	9 46' 7	recorded	l day
	~					=	CENTRALIZERS Type 304 stainless steel	after well com		7.40 , I	ecoraco	ı day
ļ		16			į	彐	6.80' - 8.00'		<u> </u>			
ا ب	Ì	$\lceil \ \rceil$				킄		Top of stainles	s stee	casing	2.0	1.
PROJECT						=	FILTER MATERIAL 32-42 silica sand					
8		i					3.10' - 12.20'	Cave from TD to	15.50	f		
۵.	٠	1					CEMENT Portland Type I					
		┝╶	18		- 1	-	0.00' - 2.20'					·
							OTHER 3/8" bentonite pellets _ 2.20' - 3.10'		<del></del>	· <del>·····</del>		
							12.20' - 15.50'					
		L,	20			}						
						لــ	HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	OGISTS



CLIENT/SUBJECT	W.O. NO	W.O. NO					
TASK DESCRIPTION			TASK NO				
PREPARED BY	DEPT	DATE	APPROVED BY				
MATH CHECK BY	DEPT	DATE		_			
METHOD REV. BY	DEPT	DATE	DEPT DATE				

WELL 26-86

Method of Analysis: (Bouwer, 1978)

#### · RAW DATA

WELL # 26-86

WELL DIAMETER= 7.25 INCHES CASING DIAMETER= 2.00 INCHES .75 GALLONS VOLUME OF WATER= LENGTH OF AQUIFER TESTED= 7.05 FEET VALUE OF HO= 6.85 FEET\* STATIC WATER LEVEL= 3.95 FEET LENGTH OF SCREEN= 7.25 FEET

WATER TABLE TO BOTTOM OF WELL= 7.05 FEET \* The Ho calculated for a recovery of 0.75 gallons is 4.60 feet, Because this is less than the first residual drawdown recorded (6.85 feet) at T=15.5 minutes, Ho less than the SLUG TEST DATA: has been set at 6.85 feet for this analysis.

TIME	WATER LEVEL (FEET)	TIME SINCE TEST BEGAN (MINUTES)
12. 5.30	10.80	15.50
12. 6. 0	10.60	16.00
12. 6.30	10.51	16.50
12. 7. 0	10.45	17.00
12. 7.30	10.38	17.50
12. 8. 0	10.35	18.00
12. 8.30	10.30	18.50
12. 9. 0	10.25	19.00
12. 9.30	10.22	19.50
12.10. 0	10.08	20.00
12.11. 0 12.12. 0	10.05	21.00
12.12. 0 12.13. 0	10.02 9.94	22.00 23.00
12.14. 0	9.90	24.00
12.15. 0	9.90	25.00
12.16. 0	9.84	26.00
12.17. 0	9.82	27.00
12.18. 0	9.82	28.00
12.19. 0	9.74	29.00
12.20. 0	9.69	30.00
12.22. 0	9.65	32.00
12.24. 0	9.62	34.00
12.26. 0	9.59	36.00
12.28. 0	9.50	38.00
12.30. 0	9.50	40.00
12.32. 0	9.45	42.00
12.34. 0	9.45	44.00
12.36. 0	9.44	46.00
12.38. 0	9.41	48.00
12.40. 0	9.41	50.00
12.45. 0	9.39	55.00
12.50. 0	9.34	60.00
12.55. 0	9.31	65.00
13. 0. 0 13. 5. 0	9.26	70.00 <b>75.00</b>
13.10. 0	9.23 9.22	80.00
13.15. 0	9.18	85.00
13.20. 0	9.15	90.00
13.25. 0	9.14	95.00
13 35 0	9 11	105 00

	10.40.	7.00	110.00
	13.55. 0	9.02	125.00
	14. 5. 0	9.00	135.00
	14.15. 0	8.99	145.00
	14.25. 0	8.99	155.00
	14.35. 0	8.98	165.00
	14.45. 0	8.96	175.00
	14.55. 0	8.96	185.00
	15. 5. 0	8.96	195.00
	15.20. 0	8.93	210.00
	15.35. 0	8.92	225.00
•	32.12. 0	8.82	1222.00
	37.26. 0	8.75	1536.00
	61.33. 0	8.78	2983.00
	***43. 0	8.93	7013.00
	***20.0	8.90	7410.00
	***19. 0	8.97	8429.00
	***38 0	8 90	8808 00

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WELL # 26-86

WELL DIAMETER= 7.25 INCHES CASING DIAMETER= 2.00 INCHES VOLUME OF WATER REMOVED OR ADDED TO WELL: .75 GALLONS LENGTH OF AQUIFER TESTED= 7.05 FEET VALUE OF HO= 6.85 FEET STATIC WATER LEVEL= 3.95 FEET

#### SLUG TEST DATA:

TIME SINCE TEST BEGAN (MINUTES)	WATER LEVEL (FEET)	DRAWDOWN (FEET)	HEAD RATIO	RECIPROCAL TIME (1/MINUTES)
15.50	10.80	6.85	1.000	.065
16.00	10.60	6.65	.971	.063
16.50	10.51	6.56	. 958	.061
17.00	10.45	6.50	. 949	.059
17.50	10.38	6.43	. 939	.057
18.00	10.35	6.40	. 934	.056
18.50	10.30	6.35	.927	.054
19.00	10.25	6.30	.920	.053
19.50	10.22	6.27	.915	.051
20.00	10.08	6.13	. 895	.050
21.00	10.05	6.10	.891	.048
22.00	10.02	6.07	. 886	.045
23.00	9.94	5.9 <del>9</del>	.874	.043
24.00	9.90	5.95	.869	.042
25.00	9.90	5.95	.869	.040
26.00	9.84	5.89	.860	.038
27.00	9.82	5.87	.857	.037
28.00	9.82	5.87	. 857	.036
29.00	9.74	5.79	.845	.034
30.00	9.69	5.74	. 838	.033
32.00	9.65	5.70	.832	.031
34.00	9.62	5.67	.828	.029
36.00	9.59	5.64	.823	.028
38.00	9.50	5.55	.810	.026
40.00	9.50	5.55	.810	.025
42.00	9.45	5.50	.803	.024
44.00	9.45	5.50	.803	.023
46.00	9.44	5.49	.801	.022
48.00	9.41	5.46	.797	.021
50.00	9.41	5.46	. 797	.020
55.00	9.39	5.44	.794	.018
60.00	9.34	5.39	.787	.017
65.00	9.31	5.36	.782	.015
70.00	9.26	5.31	.775	.014
75.00	9.23	5.28	.771	.013
80.00	9.22	5.27	.769	.013 .012
85.00 90.00	9.18	5.23	. 764 . 759	.011
95.00	9.15	5.20 5.19		.011
105.00	9.14 9.11	5.16	.758 .753	.010
115.00	9.06	5.11	.746	.009
125.00	9.02	5.07	.740	.008
135.00	9.00	5.05	.737	.007
145.00	8.99	5.04	. 736	.007
175.00	3.00	S 04	. 700	

165.00	<b>0.78</b>	5.03	4د/.	.006
175.00	8.96	5.01	.731	.006
185.00	8.96	5.01	. 731	.005
195.00	8.96	5.01	.731	.005
210.00	8.93	4.98	.727	.005
225.00	8.92	4.97	.726	.004
1222,00	8.82	4.87	.711	.001
1536.00	8.75	4.80	.701	.001
2983.00	8.78	4.83	.705	.000
7013.00	8.93	4.98	.727	.000
7410.00	8.90	4.95	.723	.000
8429.00	8.97	5.02	.733	.000
8808.00	8.90	4.95	. 723	.000

WELL # 26-86

\_\_\_\_\_\_

PERMEABILITY BASED ON COOPER, BREDEHOEFT, AND PAPADOPULOS METHOD

PERMEABILITY=5.00E-04/ MATCH TIME (IN MINUTES)
STORAGE COEF= 7.61E-02\* ALPHA

COMPUTER CALCULATES
ALPHA= .10 MATCH TIME= 1.52E+03
PERMEABILITY= 3.29E-07 CM/SEC

ALPHA= .10 MATCH TIME= 1.52E+03 PERMEABILITY= 3.29E-07 CM/SEC STORAGE COEF=7.61E-03 CORRELATION NUMBER= .98

\_\_\_\_\_\_

PERMEABILITY BASED ON REGRESSION FIT OF HEAD RATIO DATA

HVORSLEV PERMEABILITY=7.88E-04 / LAG TIME BOUWER PERMEABILTY=1.30E-03 \* -SLOPE

COMPUTER CALCULATES

PERMEABILITY VARIES MORE THAN 20% DEPENDING ON THEEQUATION

FOR X ON Y: HVORSLEV PERMEABILITY=1.68E-08 CM/SEC

BOUWER PERMEABILITY=9.45E-09CM/SEC FOR Y ON X: HVORSLEV PERMEABILITY=1.02E-07 CM/SEC

BOUWER PERMEABILITY=6.20E-08 CM/SEC

AVERAGE HVORSLEV PERMEABILITY=2.89E-08 CM/SEC AVERAGE BOUWER PERMEABILITY=3.57E-08 CM/SEC

REGRESSION STATISTICS

X ON Y

INTERCEPT= -.09

SLOPE = -7.26E-06

Y ON X

INTERCEPT= -.06

SLOPE=-4.76E-05

CORRELATION COEFFICIENT= -.39

CALCULATIONS INDICATE THAT A VALUE OF 8.70 FEET FOR HO
OR A VALUE OF 1.774 INCHES FOR EFFECTIVE CASING DIA.

MAY YIELD BETTER RESULTS

PERMEABILITY BASED ON REGRESSION FIT OF DATA - FERRIS & KNOWLES METH

PERMEABILITY=5.74E-04 / SLOPE PERMEABILITY=2.11E-05 CM/SEC

REGRESSION STATISTICS

X ON Y

INTERCEPT= 4.88

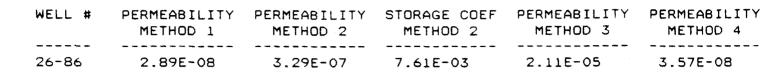
SLOPE= 2.71E+01

Y ON X

INTERCEPT= 4.88

SLOPE= 2.74E+01

CORRELATION COEFFICIENT= .99



<sup>\*</sup> METHOD 1 IS HVORSLEV

METHOD 2 IS COOPER, BREDEHOEFT, AND PAPADOPULOS

METHOD 3 IS FERRIS AND KNOWLES

METHOD 4 IS BOUWER

### AQUIFER TEST DATA

, , <b>, , , , , , , , , , , , , , , , , </b>	
TYPE OF AQUIFER TEST boil down vectost	PUMPING or RECOVERY DATA
HOW Q MEASURED 4 gall bucket	PAGEOF
HOW W.L.'S MEASURED JOLOMAN THE THE THE THE THE THE THE THE THE THE	PUMP ON: date 11 12 86 time 11.50
MEAS. POINT FOR W.L.'s	PUMP OFF: date 11 12 86 time 12:04
ELEVATION OF MEAS. POINT	DURATION OF AQUIFER TEST

EL	ELEVATION OF MEAS. POINT				DURATION OF AQUIFER TEST									
Γ	TIME		/ <b>-</b>	WATER LEVEL				DATA 3,95 1.25		DISCHARGE			OMMENTS	
┝	t=	a coul		- 0	READING CONVENSIONS WATER				READ-		ပ္သမ		OMMENTS	
D A	CLOCK	Ł	1				LEVEL	\$ OF 8'		ING	Q			13.33
Г	1255				0306	100	0.0	6.0	-7			CW		SMOTED BAILM
	1205				18+31	2.30	10.80	6.85				<u> </u>		STATE MINING
	1206	1.0			15+2.9		10.60	6.65			.*	Ц_	175	- AMT BUD
	1206/	1.5			15+2.81		10.51	6.56				Ц	<u> </u>	
	1207	20			1012,75		10.45	6.5					↓	
	1707/-	2.5	g.		10+2,68		10.38	6.43				Щ	<b>↓</b>	
	1208	30			10+0.65		10.35	6.4				4	100	
	1704/	3.5			1012.60		10.30	6,35			FLIM)	1	ME	ce = 6.9=
	1209	4.0			101 2,55		10.25	6.30				1	—	
	12:9 12	4.5			10+252		10.22	10.27				Щ	<u> </u>	
	12 10	5			10+2.38		10.08	6.13				$\sqcup$		
	1211	6			101235		10.05	6.1				Ш	<del> </del>	
		7			10+2.32		10.02	6,07				<u> </u>	1	
	12,3	8			10+2,24		9,94	5,99 5,95						
	1214	9			10+22		9.90	5,95					<u> </u>	
	1215	16			10+2,2		9,90	5.95				Ш	<u> </u>	
	1216	//			10+214		9.84	5.89					<u> </u>	
	1217	12			10+2.12	1	9.82	5.67				L	<u> </u>	
	12.18	13			10+2,12		9.8Z	5.87						
	12 A	14			10+2.04	1	9.74	5.79					<u> </u>	
	12.00	K			10+ 1,99		9,69	5.74				1	<del> </del>	
	1272	17			10+1.95	1	2.65	5.7				4	—	
	12.24	19			10+1.92		9.62	5.67				1	ــــ	
L	17.26	21			10+1.89		9.59	5.64					ـــــ	
	17.28	23			10+1.80		9.50	5.64 5.55				L		
	1230	25			10-1.80		2.50	5.55				<u> </u>	<u> </u>	
	1232	27			10 1.75		9.45	5,50				1	ــــــ	
	1234	29			10+ 1.75		9.45	5.50				1	<del> </del>	· ·
	1236	31			10+1.74		2.44	5,49				1	<u> </u>	
	1234				J+ 1.71		9.41	5.46				1	ـــــ	
	12/5	35			C+ 1.4/		9.41	5,4b					<u> </u>	
	1045	40			16+169		9.39	5.44						
	1250	45			10+164		9.34	5.39					<u> </u>	·
L	1255	60			10+1.61		9.31	5,36						
	13.00	55			10+1.56		9.26	5.31					↓	
	130K	66			101.53		9.23	5,28				1	<del> </del>	
	1310	65			10 + 1.52		9.22	5,27					<u></u>	
	1315				10+148		9.18	5,23				4	-	
	1320	15			1011.45		9.15	5,20				$\perp$	<del> </del>	
	1325		>		10+149		2.14	5.19						
7	1335		T		10+1.4		9.11	5.16				W	1	

HYDRO-SEARCH

RENO. DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

## - AQUIFER TEST DATA

TYPE OF AQUIFER TEST\_\_\_\_\_

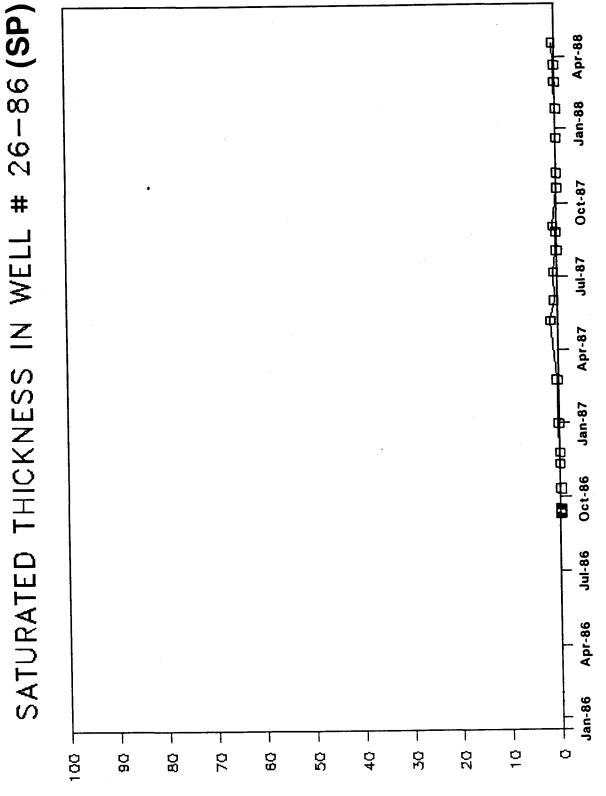
PUMPING or OBSERVATION WELL PUMPING or RESOVERY DATA

		HOW Q MEASURED								PAGE OF							
										DEPTH OF PUMP/AIRPIPE							
		MEAS. POINT FOR W.L.'S									PUMP ON: datetime						
		ELI	EVATION	OFME	AS. POI	NT					OF AQUIFER TEST						
				TIA		**************************************			R LEVEL			DISC	HARGE	RDED	COMMENTS		
		0	CLOCK TIME		1'	T		CONVERSION		s or 8'		READ-	Q	RECO	COMMENTS		
		Ì	1345		<del>                                     </del>		10+1.3/		2.06	5.11		1		au			
		$\neg$	1355			1	10+1.33		202	5.01				ì			
	1		1405				10+1.30		2,00	5,050				П			
			1415			T	10+1.29		8.90	5.04				П			
	[		1425	140		1	10+1,29		8.99	5.04	1			П			
			14:35			1	10+1.28	-	8.98	5.03				IT			
}			1445				10+1,26		896	5.01							
			1455				10+1,2%		8.9%	5.01							
1 _			1505				10+1.21		8.%	5.01							
-	[1	/	1520				10+12		8.93	4.98							
-	: [	7	1535				10 + 1.22	T	8.92	4.97							
NON							1		-					1			
LOCATION		2	8:12				10+112		8.82	4.87							
.0 C	ΙŢ	2	13:26				10+1.05		8.75	4.80							
	. [		/3:33				10+108		8.78	4.83							
			8.43				10+1.23		8.98	4.98							
	ſ	6	K:20				10+1-20		8.90	4.95							
1 1	ı[	7	9:19				10+1.27		8.97	5.02				•			
		7	14.38				10+1.20		290	8.95							
											ENOUGH	DARK	EU SA	15			
												•					
1																	
															•		
	L																
		$\perp$															
1 1		$\bot$															
		$\perp$															
1																	
5		_															
PROJECT																	
PR(		1															
	L	$\perp$															
	L	_															
		$\perp$															
		$\perp$															
	L	$\perp$												]			
	L	┙															

### ROCKY FLATS SOLAR PONDS

### WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2686	01/27/86	5974.48	5976.49	2.01	11.00	11.60	5964.89
	09/12/86					11.34	5965.15
	09/13/86					11.54	5964.95
	09/15/86					11.45	5965.04
	09/16/86					11.63	5964.86
	09/17/86					11.64	5964.85
	09/18/86					11.67	5964.82
	10/13/86					11.86	5964.63
	11/12/86					11.60	5964.89
	11/26/86					11.32	5965.17
	01/01/87					10.71	5965.78
	02/25/87					10.54	5965.95
	05/08/87					9.48	5967.01
	06/03/87					10.25	5966.24
	07/08/87					10.20	5966.29
	08/04/87					10.80	5965.69
	08/27/87					10.70	5965.79
	09/03/87					10.20	5966.29
	10/21/87					11.50	5964.99
	11/09/87					11.60	5964.89
	12/21/87					11.60	5964.89
	01/27/88					11.60	5964.89
	02/29/88					10.80	5965.69
	03/21/88					10.70	5965.79
	04/18/88					10.40	5966.09



SATURATED THICKNESS (ft.)

DATE

### INDEX OF DATA

Boring No.: 27-86						
Completed as well? Yes						
Data in File						
X Log of Borehole						
X Well Construction Summaries						
Well Development Summaries						
X Hydraulic Conductivity Test Data and Results						
X Packer Test Data and Results						
X Water Level Data						
X Saturated Thickness Hydrographs						

Project: Rocky Flats Plant

# LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation

Elev. (feet)	Depth (feet)	Sample Grap Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Conjent 20 40	Other Tests		
	0	//:00:	ARTIFICIAL FILL					
		0.8			_			
	_		.9 Recovered 1.0/2.0'=50%.		_			
	_	//0.2	GRAVEL: dusky brown (5YR	1		43		
-	_	1000	coarse sand nebbles and	Į į	_			
	_	1.0	cobbles; some fine-grained	1	_			
	_		sand; silty; slightly calcareous; poorly sorted;	1				
	-	000	subangular;		_			
		/ / 100	unconsolidated; dry.		_			
		// 20	0: 2.0-4.0'-Sample.		-			
		/ ///			_	1		
	, –		Recovered 0.9/2.0'=45%. GRAVEL: Same as above;		_	1		
	-	1/10	calcareous; horizontal bedding; poorly sorted;			1		
	_	/ 100	unconsolidated; dry.	1				
	-		4.0-7.0'-Sample.		_	1		
	1 –	//00	Pecovered 3 0/3 01=1003		-	1		
	- 1	1 20	GRAVEL: very pale orange		_			
	_	/ 000		1		ł		
	_	// 00	aradon dorminand into		-			
		/ p. ∇			-			
		//	<pre>6/6) coarse-grained sand; trace silt and clay;</pre>	}		1		
l		/ <b>/ L</b> EE	noncalcareous; poorly		_	1		
	10 —		sorted; subangular; damp.		_	1		
	-		7.0-8.0'-Sample.	}		1		
	I –	//==	Recovered 0.0/1.0'=0%.		-	1		
	-		8.0-12.0'-Sample.	1	-	1		
	<b>I</b> –		Recovered 4.0/4.0'=100%.	1	-	1		
	-	<b>/ /</b> 注		1	-	-		
	_	/ 注意	8.0-9.2'. GRAVEL: very		-	<b>.</b> .		
		<b>Y</b> / E	pale orange (10YR 6/2) to grayish orange (10YR 7/4)		_	4		
Ī	1 -	V / <b>!</b> ≕	pebbles with dark	1		1		
	-	$V/\equiv$	yellowish orange (10YR		_	1		
	-	1 / 🖾	6/6) coarse-grained sand; gravel layer at bottom;		_	]		
	15 —	/ /E	poorly sorted;	ı	1	1		
	-	1//==	unconsolidated; wet.		-	1		
	-	<b>Y</b> / <b>E</b>	ARAPAHOE FORMATION	1	-	1		
	l -	//=	<del></del>	1	•	1		
	_	<b>√</b> /==	9.2-12.0'. CLAYSTONE: pale olive (10Y 4/2) to	I	-			
		<b>]</b> / /==	grayish olive (10Y 4/2)	1	j -	4		
			with dark yellowish orange (10YR 6/6) mottling;			4		
	I -	Y/ 🚐	== (101x 6/6) mottling; === silty; coarse-grained			1		
	-	<b>V</b> /==	sandstone stringer at	1		_		
	-	1//=	9.8'; firm; weathered; damp.		•	1		
	20	1//篮		1,111	1	1		
0								
Remarks Logged by: T. Murphy & J. Bergman Checked by: Checked by:								

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# LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 Boring Method Hollow Stem Auger NC Core Coordinates N 37794.1 E 22134.9 Ground Surface Elevation 5961.86

	-25			12.0-17.0'-sample. Recovered 5.0/5.0'=100%. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottling. At 15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark			
	-25-			CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottling. At 15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark			
	-25-			7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottling. At 15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark			
	-25-			with dark yellowish orange (10YR 6/6) mottling. At 15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark			
	-25-			(10YR 6/6) mottling. At 15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark			
	-25-			15.5' grades into medium dark gray (N 4) claystone; unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark			
	-25			dark gray (N 4) claystone; unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		-	
	-25			unweathered; damp to wet.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark			
	-25			17.0-22.0'-Sample. Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles: firm: damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		-	
	-25			Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		- - -	
	-25-			Recovered 5.0/5.0'=100%.  17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		- - - -	
	-25			17.0-19.6'. CLAYSTONE: light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		- - - -	
	-25			light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		- - -	
	-25-			light gray (N 7) to medium gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		- - -	
	-25 - - - - -			gray (N 5) with dark yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		- - -	
	11111			yellowish orange (10YR 6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		-	
				6/6) mottles; firm; damp.  19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		-	
	11111			19.6-22.0'. CLAYSTONE: pale olive (10YR 6/2) claystone with slight dark		_	
	1111			pale olive (10YR 6/2) claystone with slight dark		_	i
				pale olive (10YR 6/2) claystone with slight dark	1	_	
	1			claystone with slight dark			
	1				1	ł	
	=			yellowish orange (10YR		· -	<b>i</b> i
	7			6/6) mottling along	j	_	1 1
	-	1 1		fractures; some ironstone	İ		1 1
		1 1		in fractures; firm; damp.	İ		1.
				23.0-28.5'-Sample.		-	1
			-1-1-1-	Recovered 3.5/5.0'=69%.	1		
				RQD 2.9/3.5=87%.		i -	1
	-20		E-1-1-1	CLAYSTONE: dark yellowish		-	1 1
	-30			orange (10YR 6/6); sandy; grades downward into a	i	_	]
	-			dusky yellow (5Y 6/4)	1		1
	_			sandy claystone; several			1 '
				patches of white very			4
	-		E-I-I-I-I	fine-grained sand;			1
	_			consolidated; dry.	ł	-	1
				•		-	4
			=======	28.5-33.5'-Sample.		_	i I
				Recovered 2.0/5.0'=40%.		1	1
			-2-2-2-	RQD 1.5/2.0'=75%.			1
1				CLAYSTONE: light gray (N	1	1 -	1
			E	7) and pale yellowish	i i		1
				brown (10YR 6/2); white	ł	-	1
	_			caliche at 31.5' (0.25" thick); strong reaction			4
	<b>-</b> 35 <b></b>		E	strongly with HCL;	l l	<b>!</b>	
1	_			consolidated; dry.	•	1	1
				Tomourance, ary.			-{
				33.5-38.5'-Sample.	1	1	1
	_			Recovered 2.1/5.0'=42%.	ł	1	1
				RQD 2.1/2.1'=100%.	1		-1
				CLAYSTONE: dark yellowish	ı	]	J
	-			orange (10YR 6/6) with	1	ľ	
	_		+3-1-1-1	moderate yellowish brown	I	1	1
				(10YR 5/4) limonite	1		4
1 i	_			stains; grades downward	1		1
l i	_	1		into a pale yellowish	1	1	1
				brown (10YR 6Y2) slightly sandy claystone;	1		4
1		T	E	consolidated; dry.			
	40	<b>1</b> 1		rphy & J. Bergman		Checked by:	VOLD

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#### LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86 Boring Method Hollow Stem Auger/NC Core

Coordinates N 37794.1 E 22134.9 5961.86 **Ground Surface Elevation** 

Elev. (feet)	Depth (feet)	Sempla Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Conject 20 40	Other Tests
	40						
				38.5-43.5'-Sample.	1		
				Recovered 3.6/5.0'=73%.		-	
				RQD 3.6/3.6'=100%.		-	
				CLAYSTONE: light olive		-	
				<pre>gray (5Y 5/2); some fine to very fine-grained sand;</pre>			
	_			dark yellowish orange		_	
	_			(10YR 6/6) mottling; black			
				organic fragments; few		_	
				caliche stringers;		_	
				consolidated; dry.	1	-	1
	_					-	1
	/.5					_	
	ـــر ب					_	1
	_	1		43.5-47.5'-Sample.			
	I —	1		Recovered 1.6/4.0'=40%.		-	1
	l _	1	[- <u></u>	RQD 0.8/1.6'=50%.		-	<del>j</del>
				CLAYSTONE: yellowish brown (10YR 2/2) with some		_	1
	-	1		moderate yellowish orange		_	1
	-	1		(10YR 6/6) mottling;			
	_			sandy; few black organic		· -	1
	_		-1-1-1-	fragments; consolidated;		_	-
				damp.			
	_	1		47.5-52.5'-Sample.			1
	-	1		Recovered 5.0/5.0'=100%.	1	-	1
	<b></b> 50 <b></b>	1	<u> </u>	RQD 5.0/5.0'=100%.		-	1
	30			CLAYSTONE: olivegray (5Y			4
	_	1		3/2); no mottling;		_	<u>j</u>
	-	1		<pre>homogenous; consolidated; dry.</pre>		Ī	1
i i	l –	4		all.		-	1
		]		52.5-57.5'-Sample.		<b>}</b> -	ł
	_			Recovered 3.5/5.0'=70%.	1	i .	1
	-	1		RQD 2.5/3.5'=71%.			1
	I —	4		CLAYSTONE: Same as above; dry.		-	1
	<u> </u>	1		uly:	l	-	-1
_	1			57.5-62.5'-Sample.		j -	4
	_	]		Recovered 5.0/5.0'=100%.		_	1
	-	1		RQD 5.0/5.0'=100%. CLAYSTONE: olivegray (5Y	I	· ·	1
	55	4	=====	3/2) with moderate	1	•	1
	١ -	1		yellowish brown (10YR 5/4)	1	-	1
				mottling; at 59.0' and	Į.		1
	_	1		59.5' hit a thin layer			j
	-	4		0.3' and 0.1' thick,	1	1	7
1	_	4		respectively, of moderate yellowish brown (10YR 5/4)	1	-	1
	1			siltstone nodules; very	1		4
	I -			fine-grained; dry.			
	-	1					1
	i -	4			1	-	1
	_	4		i	1		-1
					1		1
	60						
			т и	why f I Baroman		Checked by:	MI
Kem	MIKS L	ogged by	y: 1. MU	rphy & J. Bergman			

Project No.

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# LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core 5961.86 **Ground Surface Elevation** 

lev. eet)	Depth (feet)	Semple Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests
	60						
1	_					-	
I						_	1
- 1					1 1	_	i
							l
- 1	-					-	1
	_					_	ł
				62.5-67.5'-Sample.		_	i
ı				Recovered 5.0/5.0'=100%.			1
1	-			RQD 5.0/5.0'=100%.		_	1
ı				CLAYSTONE: olivegray (5Y		_	ł
1				3/2); sandy; several		_	1
ł				moderate yellowish brown	i		
ł	<del></del> 65		=====	(10YR 5/4) siltstone			1
1				nodules at 66.4', 66.9'	]	_	ł
1				and 67.0'; each layer is less than .05' wide;	]		1
				consolidated; moist.			1
1	_			00001144004, m0100.		-	i
ı				67.5-72.5'-Sample.		_	ł
1				Recovered 5.0/5.0'=100%.		_	]
- 1				RQD 5.0/5.0'=100%.		_	3
ı	_			CLAYSTONE: olivegray (5Y		-	1
1				<pre>3/2); sandy; moderate yellowish brown (10YR 5/4)</pre>		_	į
				siltstone nodules;		•	i
ı				consolidated; moist.		_	1
	_			· · · · · · · · · · · · · · · · · · ·			1
	<del></del> 70					_	1
- [	70					_	1
- 1						_	1
ł	_						1
1							4
I				72.5-77.5'-Sample.	1		]
- 1				Recovered 4.4/5.01=88%.	1		1
ı	-			RQD 4.4/4.4'=100%.		-	1
ı				CLAYSTONE: olivegray (5Y		_	4
1				<pre>3/2); sandy; layer of</pre>	1	_	] .
-				moderate yellowish brown	1	_	1
1	_			(10YR 5/4) siltstone nodules 73.8';		-	1
ı				consolidated; moist.	į į		4
ı	7,					_	1
ı	75 —					_	1
1	-					-	1
1						-	4
•					]		J
			<b></b>			_	1
•	_					-	1
•						_	4
•				77.5-82.5'-Sample.	1	_	<b>J</b> .
	_			Recovered 4.5/5.0=90%.		•	
1	_			RQD 4.5/4.5'=100%.		-	1
	_			CLAYSTONE: olive gray (5Y		_	4
				3/2); sandy; black organic			I
	80	1		<pre>fragments; consolidated; damp.</pre>			1
	OU		<u></u>	mp.		Checked by:	77 1 /2

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# LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring-Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

Elev. feet)	Depth (feet)	Sampla Type	Grachic Lóg	Material Description	Penetration Resistance (Blows/inch) 20 40	Content Content 20 40	Other
	80						
•					1	-	
	-					-	
	_				1	_	
					1	-	
	_			82.5-87.5'-Sample. Recovered 5.0/5.5'=91%.		-	
I	-			RQD 5.0/5.0'=100%.			
i				CLAYSTONE: Same as above;			
				damp.			
	0.5			87.5-92.5'-Sample.			
1	—85 <b>—</b>			Recovered 5.0/5.0'=100%.	1	7	
ı	-			RQD 5.0/5.0'=100%.	1 1	_	
	_			CLAYSTONE: olivegray (5Y		_	
				3/2); moderate yellowish brown (10YR 5/4) siltstone	1	_	
				nodules 91.8 '; black		_	
ı				organic fragments:			
	-			consolidated; damp.		_	·
						_	
						_	
- 1							
						-	
ł	90-					_	
ı	_					_	
						_	
1	_			03 5 05 51 5			
				92.5-97.5'-Sample. Recovered 3.2/5.0'=64%.		-	
	-			RQD 3.0/3.2'=94%.	1 1	_	•
Ī				CLAYSTONE: olivegray (5Y		_	
_				3/2); black organic	1	_	
ı				<pre>fragments; consolidated; dry.</pre>			
	_						
	_					-	
	<del></del> 95					-	
	_				1	_	
					1		
1					1 1		
	_				- <u> </u>	. •••	
	_			97.5-102.5'-Sample.	1 1	-	
	_			Recovered 5.0/5.0'=100%.	j i	_	
				RQD 2.5/5.0'=50%.	1	-	
				SILTSTONE: olive gray (5Y			
1	_			<pre>3/2); very fine-grained; slightly sandy; black</pre>	] [		
				organic fragments;	1 1	_	
1	100			laminated; homogeneous;	1.,		
	100		글로 프	consolidated; dry.			

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#### LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5961.86

Elev. (feet)	Elev. Depth Sample Graphic (feet) Type Log		Graphic Log	Material Description	Content Content 20 40	Other Tests	
	100		薬				
						-	
				102.5-107.5-Sample.		_	
				Recovered 3.8/5.0'=76%.		_	
				RQD 3.0/3.8=79%. SILTSTONE: Same as above;			
				dry.		_	
	-105			107.5-110.5'-Sample.			Ì
	103		万月	Recovered 3.0/3.0'=100%.		-	l
				RQD 3.0/3.0'100%. SILTSTONE: Same as above;			1
				dry.		_	
						_	1
	_					_	1
	_					_	Ì
	_			·	•	_	
	_					_	}
	_					-	1
	110					_	ŀ
	_	1				-	ļ
	_	1		110.5-113.5'-Sample.		-	1
	-	]		Recovered 0.25/3.0'=8%. RQD 0.0/0.25'=0%.		-	ł
	_			SILTSTONE: Same as above;		-	ł
	-	4		dry.	<b>-1</b>	-	ł
	_	4		/ 113.0-117.0'-Sample. Recovered 2.2/4.0'=55%.		-	ŀ
-	-	1		RQD 0.1/2.2'=5%.		-	ł
	_	4		CLAYSTONE: Olive gray (5Y 3/2); silty; some very		-	1
	-	4		fine-grained sand; black		-	1
	115	4		organic fragments; homogenous; consolidated;		-	ł
	-	4		damp.		-	1
	-	1				-	1
	-	4				-	1
	-	4		1		-	1
	-	1		117.0-122.0'-Sample.		-	1
	-	1		Recovered 3.5/5.0'=70%. RQD 2.7/3.5'=77%.		-	1
	-	4		CLAYSTONE: olive gray (5Y 3/2); silty; few organics;		l -	1
	l -	1		homogenous; damp.		-	1
	120	1			1111	1 1 1 1 1 1	1
Rem	<u> </u>	ogged 1	by: T. M	urphy & J. Bergman		Checked by:	MP
Proj	ect No	•		Hydro-Search	Inc		

Hydro-Search, Inc.

Page 6 of 8

#### LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86

Coordinates N 37794.1 E 22134.9

Rocing Method Hollaw Stem Auger NC Core

Boring Method Hollow St			m Auger/NC Core Ground Surface Elevation 5961.86				
Elev. (feet)	Depth (feet)	Semple Graphic Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests	
	120		122.0-127.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'100%. CLAYSTONE: olive gray (5Y 3/2); silty; some very fine-grained sand; few organic fragments; homogenous; hard; dry.  127.0-132.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'= 100%.  127.0-129.0'. CLAYSTONE: olive gray (5Y 3/2); sandy; black organic fragments; homogeneous; consolidated; dry.  129.0-132.0'. SANDSTONE: clay grades into light gray (N 7) sandstone; silty; very fine-grained; thin clay laminae; few organics; well sorted; rounded; consolidated; dry.  132.0-137.0'-Sample. Recovered 3.5/5.0'=70%. RQD 2.3/3.5=66%. 132.0-133.9'. SANDSTONE: light gray (N 7); silty; very fine-grained; very thin clay laminae; well sorted; rounded; consolidated; dry.				
			133.9-137.0. CLAYSTONE: grades into olive gray (5Y 3/2) claystone; silty and sandy; laminations in sandy intervals; no organics; consolidated; dry.  137.0-142.0'-Sample. Recovered 3.2/5.0'=64%. RQD 2.2/3.2'=69%. CLAYSTONE: olive gray (5Y 3/2); light brown (5YR 6/4) mottling; no organics; homogenous; slightly damp.				

Remarks Logged by: T. Murphy & J. Bergman

Checked by:

Project No.

106P06222

Hydro-Search, Inc.

Page 7 of 8

# LOG OF BORING NO. 27-86

Date Drilled 8/29/86 and 9/12/86 to 9/18/86
Boring Method Hollow Stem Auger/NC Core

Coordinates N 37794.1 E 22134.9 Ground Surface Elevation 5961.86

142.0-147.0'-Sample. Racovered 5.0/5.0'=100t. RODS/SONE: -01se gray (5Y 2)/2): silty: some verty fine-grained sand; grades downward into very fine-grained sand; grades downward into very fine-grained silty: few organics: laminated; well sorted; rounded; consolidated; dry.  147.0-152.0'-Sample. Recovered 5.0/5.0'=100t. ROD5.0/5.0'100t. CLAYSTONE: olive gray (5Y 3/2) silty claystone and pale olive (10Y 6/2) very fine-grained silty sandstone; sandstone layers are less than 0.1' thick; well sorted; few organics: 2 dusky yellow (5Y 6/4) siltstone pocketts ancreased clay content with depth; consolidated; hard; slightly damp.  152.0-157.0'-Sample. Recovered 3.1/5.0'=62t. RQD0.8/3.1'=26t. CLAYSTONE: alternating bands of olive gray (5Y 3/2) (Laystone and very fine-grained gray (N7) silty sandstone; grades downward into olive gray (5Y 3/2) silty claystone; pale yellowish brown (10YR 6/2) siltstone pocket 3.1/5.0' isome of the consolidated; hard; slightly damp.  TOTAL DEPTH: 157.0'	Elev. (feet)	Depth (feet)	Semple Type	graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Content 20 40	Other Tests
		145			Recovered 5.0/5.0'=100%. RQD 3.8/5.0'=76%. CLAYSTONE: olive gray (5Y 3/2); silty; some very fine-grained sand; grades downward into very fine-grained gray (N7) sandstone; silty; few organics; laminated; well sorted; rounded; consolidated; dry.  147.0-152.0'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'100%. CLAYSTONE: olive gray (5Y 3/2) silty claystone and pale olive (10Y 6/2) very fine-grained silty sandstone; sandstone layers are less than 0.1' thick; well sorted; few organics; 2 dusky yellow (5Y 6/4) siltstone pockets at 148.0'; sample exhibits increased clay content with depth; consolidated; hard; slightly damp.  152.0-157.0'-Sample. Recovered 3.1/5.0'=62%. RQD 0.8/3.1'=26%. CLAYSTONE: alternating bands of olive gray (5Y 3/2) claystone and very fine-grained gray (N7) silty sandstone; grades downward into olive gray (5Y 3/2) silty claystone; pale yellowish brown (10YR 6/2) siltstone nodule at 155.0'; consolidated; slightly damp.			
		-						

Project No. 106P06222

Hydro-Search, Inc.

Page 8 of 8

WELL	27-86	

					W	ELL -	27-00		
		- °	*: :	WELL CONSTR					
				LOCATION or COORDS:		ID LEVEL	596	61.86'	
				N 37794.1 E 22134.9	TOP O	CASING	590	63.26 <b>'</b>	
	.	L 20	<b>%</b> =3						
	Ш			DRILLING SUMMARY:	CONSTRUCTION				
ĺ				TOTAL DEPTH Well: 133.00' Hole: 157.00'		<u>ST/</u>	ART	FIN	<u>ISH</u>
				BOREHOLE DIAMETER 0.00' - 22.00': 7성"	TASK	DATE	TIME	DATE	TIME
				22.00' - 157.00': 5 5/8"	DRILLING:	1986		1986	
	_	- 40		DRILLER Boyles Brothers Drilling Co.	7½" auger	8/29	0935	8/29	1200
1	TIL S			15865 W. 5th Avenue, Golden, CO	NC core	9/11	1545	9/17	1615
	Bergman			(Dave Jarvie, Robert Roach) 0.00; 722.00; Mobile B-57; 22.00; - RIG 157.00; Failing	Reaming	9/19	0905	9/19	0945
	- 11			BIT(S) 0.00' - 22.00': T5; 22.00' - 157.00':	GEOPHYS. LOGGING:				
8	J/VI			coring bit; stone bit, tricone	CASING: 5" steel	8/29	_1300	8/29	1330
en,	Murphy/J.	- 0////		DRILLING FLUID 0.00' - 22.00': none; 22.00'-	2" stainless	9/22	1110	9/22	1135
Colden	2			157.00': air/water mist					
٩			<b>%</b> =1	SURFACE CASING 5" x 22.6' steel w/ locking	FILTER PLACEMENT	9/22	1140	9/22	1150
	-		<b>7</b>		CEMENTING:	9/23	1820	9/24	0920
Š.	ZNE	_80		WELL DESIGN:	CEVELOPMENT:	9/30	1215	10/1	0912
LOCATION	ERSONNEL			BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
700	PER			CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	9/22	1520	9/22	1620
<i>.</i>				0.00' 21.00' C1	<u> </u>	9/19	1625	9/19	1700
				0.00'- 128.50' C2 128.50'- 133.00' S1	Packer testing Cementing 5"	8/29	1330	8/29	1400
		H00		- 133.00 51	steel	0/25	_1550_	0/25	1400
1	- 1							1	
					WELL DEVELOR	PMENT			
					See Well Develo	opment :	Summary	Sheet.	
1		<b>→</b> 20			-				
				CASING: CI 5" I.D. steel surface casing					
	ابد	- =		cz 2" I.D. Sch. 5 type 316 stain-					
	Plant			less steel, threaded and flush				·	
Ì	ats F			jointed.  SCREEN: SI 2" I.D. Sch. 5 type 316 stain-			<u> </u>		
222	Flat	<b></b> 140		less steel, threaded and flush					
106P06222	1 1			jointed, 0.010" wire wrap screen,	COMMENTS:				
9	Rocky			0.25' welded bottom cap.	Water encounte	red at	8.0' du	ring dri	illing.
			目	CENTRALIZERS None					
	1	160			Top of stainle	ss stee	l casin	g: 1.40	<u>'</u>
Ε,									
PROJECT		{		FILTER MATERIAL 32-42 silica sand					
PRC		İ		127.50' - 135.70'	·				
				CEMENT <u>Portland Type I</u> 	<del></del>				
		H80		OTHER 3/8" bentonite pellets					
		1		126.50' - 127.00'					
				135.75' - 157.00'					;
		1							
		200		13/350 05150					
				HYDRO-SEARCH RENO-DENVER	CONSULTING H	YDROL	OGISTS	G-GEOL	OGISTS



SHEET\_\_\_\_ of \_\_

CLIENT/SUBJECT	-		W.O. NO
TASK DESCRIPTION			TASK NO
PREPARED BY	DEPT	DATE	APPROVED BY
MATH CHECK BY	DEPT	DATE	
METHOD REV. BY	DEPT	DATE	DEPT DATE

WELL 27-86

Hydraulic Conductivity (cm/sec) = 1,9 × 10-7

Flowrate (apm) = 0.0833 gpm

Screened Interval (It below G.L.) = 128.5-133.0'
128.5-129.0 Claystone
129.0-133.0 Sandstone

Method of Analysis: Residual - drawdown Plot

(Driscoll, 1926 - pg 256.)

CL	łEET	-4	
35	1661	 _ 01	

CLIENT/SUBJECT		W.O. NO			
TASK DESCRIPTION			TAS	K NO	
PREPARED BY	DEPT	DATE	AP	PROVED BY	
MATH CHECK BY	DEPT	DATE			
METHOD REV. BY	DEPT	DATE	DEPT	DATE	
		. 22 0/			

WELL 27-86

$$T (qFd/ft) = \frac{264Q}{DS'} = \frac{(264)(0.0833)}{1216} = 1.81 \times 10^{-2}$$

$$K(qpd/ft^2) = T/b = 1.81 \times 10^{-2}/4.5 = 4.02 \times 10^{-3}$$

This method is valid where uso.oi solving for the for uso.oi

$$t_{min} = \frac{r^2 S}{4 T u} = \frac{(234)^2 (10^{-3})}{4 (1.81 \times 10^{-2}) (0.01)} \times \frac{1440 min}{4 a_1} = \frac{7.482.241}{642}$$

where 
$$r(ft) = \left(\frac{5\frac{5}{8}}{24}\right) ft = .234ft$$

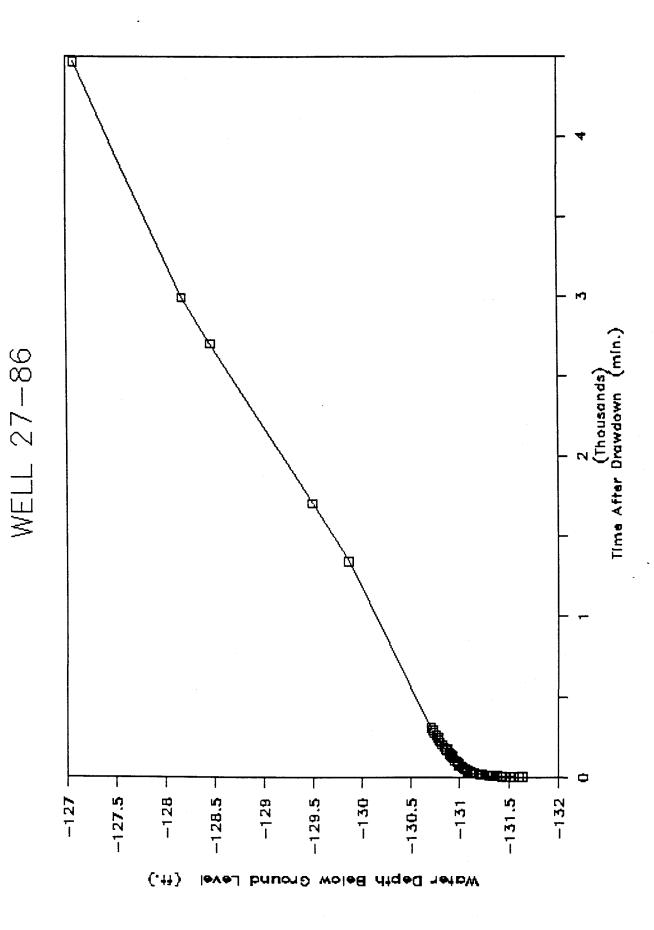
 $2 = 10^{-3}$  assumed S for confined equifer

DS' is based on points where t = 2721 min

Residual Drawdown (ft.)

0.8 WELL 27-86 0.2 4.5 iΩ 3.5 2.5 N <del>ر</del>ئ 0.5 Φ

Residual Drawdown (ft.)



	W	TELL 27-8	36	
T	T'	Water	s	log(T/T')
		Level	Rsd Drwdn	_
		(ft.)	(ft.)	
		, ,	, ,	
20.00	2.00	131.63	4.98	1.00
20.50	2.50	131.59	4.94	0.91
21.00	3.00	131.54	4.89	0.85
21.50	3.50	131.51	4.86	0.79
22.00	4.00	131.50	4.85	0.74
22.50	4.50	131.46	4.81	0.70
23.00	5.00	131.43	4.78	0.66
23.50	5.50	131.42	4.77	0.63
24.00	6.00	131.43	4.78	0.60
24.50	6.50	131.43	4.78	0.58
25.00	7.00	131.43	4.78	0.55
26.00	8.00	131.38	4.73	0.51
27.00	9.00	131.35	4.70	0.48
28.00	10.00	131.33	4.68	0.45
29.00	11.00	131.31	4.66	0.42
30.00	12.00	131.29	4.64	0.40
31.00	13.00	131.27	4.62	0.38
32.00	14.00	131.27	4.62	0.36
33.00	15.00	131.25	4.60	0.34
34.00	16.00	131.23	4.58	0.33
36.00	18.00	131.22	4.57	0.30
38.00	20.00	131.20	4.55	0.28
40.00	22.00	131.15	4.50	0.26
42.00	24.00	131.15	4.50	0.24
44.00	26.00	131.12	4.47	0.23
46.00	28.00	131.12	4.47	0.22
48.00	30.00	131.12	4.47	0.20
50.00	32.00	131.10	4.45	0.19
52.00	34.00	131.10	4.45	0.18
54.00	36.00	131.08	4.43	0.18
59.00	41.00	131.08	4.43	0.16
64.00 69.00	46.00	131.06	4.41	0.14
	51.00	131.05	4.40	0.13
74.00	56.00	131.03	4.38	0.12
84.00 89.00	66.00	131.02	4.37	0.10
94.00	71.00 76.00	130.98	4.33	0.10
99.00	81.00	130.98	4.33	0.09
104.00	86.00	130.99	4.34	0.09
114.00	96.00	130.98 130.97	4.33	0.08
124.00	106.00	130.97	4.32	0.07
134.00	116.00	130.94	4.29	0.07
134.00	110.00	120.93	4.28	0.06

		WELL 27-8	36	
T	T'	Water	s	log(T/T')
	•	Level	Rsd Drwdn	
		(ft.)	(ft.)	
144.00	126.00	130.92	4.27	0.06
154.00	136.00	130.91	4.26	0.05
164.00	146.00	130.90	4.25	0.05
174.00	156.00	130.89	4.24	0.05
184.00	166.00	130.87	4.22	0.04
194.00	176.00	130.86	4.21	0.04
204.00	186.00	130.84	4.19	0.04
219.00	201.00	130.82	4.17	0.04
234.00	216.00	130.80	4.15	0.03
249.00	231.00	130.79	4.14	0.03
264.00	246.00	130.78	4.13	0.03
279.00	261.00	130.76	4.11	0.03
294.00	276.00	130.74	4.09	0.03
309.00	291.00	130.73	4.08	0.03
324.00	306.00	130.71	4.06	0.02
1360.00	1342.00	129.87	3.22	0.01
1720.00	1702.00	129.50	2.85	0.00
2721.00	2703.00			0.00
3011.00	2993.00	128.18	1.53	0.00
4483.00	4465.00	127.08	0.43	0.00

#### AQUIFER TEST DATA

PUMPING or OBSERVATION WELL

TYPE OF AQUIFER TEST ED 1. DOCKET HOW Q MEASURED AGAI. DOCKET HOW W.L.'S MEASURED		or RECOVERY DATA
RAD./DIST. OF/FROM PUMPING WELL 1"	PUMP ON: date 11-11-86	time
MEAS. POINT FOR W.L.'S	PUMP OFF: date 11-11-26  DURATION OF AQUIFER TEST	
		0

		t=	TIN		:'= o	4 % WATER LEVEL DATA 124 ) STATIC WATER LEVEL 126.65 (NAT.)					DISCHARGE READ- Q		BOSS CONGRECON SC	PROSS CHIGHTON SUNG
	0.4			1'	<u> </u>		CONVERSIONS		s or s'		READ-	Q	RECO	COMMENTS&
	17	11:30	0.0		<u> </u>	130 +3.23		131.63	4.28		1		cw	11:10 = 10:30 346.
1,1	17	11:30		<del> </del>	<b>-</b>	170 +3.2		131.59	4.94		1		cw	
	H	11:31		<del> </del>		0 +5-14		131.54	4.89				,	Mastaph:
	$\vdash$	11.311		<del> </del>		130 13.11		131.51	4.86				"	BOLD APP 1.5 mi
	$\vdash$	11: 24				130+3.10		131.50	4.85		1			CO APR 1.5 HE
	-	11:321			<u> </u>	12073.10		131.46	4.61	<b></b>	1			
	-	1133	3.0	<del>                                     </del>	1	130+3.0		131.43	4.78	<del> </del>				20% R-OURT =
		1153/5			<del> </del>	-3.02		131.42	4.77			100	DING	
		1134	4.0			12( +3.03		131.43	4.78		1	/ NE	51.7	Jizini,
	$\vdash$	11251/2		<del> </del>		10 ±0.00 73.00		131.43	4.78					
1.7	15		5.0					131.43	4.75		+			
LOCATION	<del>12</del>		6			1-0-290	2	131.29	4.73					
PERSONNE		1137		<del> </del>	<del> </del>	295		131.35	4.70		1			
C A	$\vdash$	1139			-			131.33	4.68	<del>                                     </del>	-			
<u>ـ</u> ت	-	139		<del> </del>		18 - 29		131.31	4.66					
	$\vdash$		10	<u> </u>		· · · · · · · · · · · · · · · · · · ·		131.29	4.64		-			
	$\vdash$	1140		<del> </del>	<del> </del>			131.27	462		-			
	$\vdash$	141	//	<u> </u>	<del> </del>	130+3123			4.62					
	-	1143				130+2.87	,	131.27	7.60					
	-	43		<del></del>		13017.85		131.25	4.58	<del></del>	1			
-	╆		14		<del> </del>	130+2.63	-	131.23			-			
	$\vdash$	11.5		<del> </del>		136+2.82		131.22	4.57		-			
	$\vdash$		18			7		131.20	-		-			
	-	= 2		·		-275		13115	4.50		+			
	$\vdash$	<del> </del>	22	<u> </u>	<del> </del>	40,75		131.15	4.50	<del> </del>				
	$\vdash$	11 74				13-272	-	131.12	4.47	<del> </del>	1 1			
	$\vdash$	1156				17-272	-	131.12	4.47	<del> </del>			-	
	-	458			<del> </del>	1 3.72		131.12	9.47	<del> </del>				
	-	1200	30		<del> </del>	17,230		131.10	4.45	<del> </del>				
	$\vdash$	1202			<del> </del> -	2017.70		131.10	4.45	<del> </del>				
-	+	1204				120+7.64		131.08	4.43					
	-	1209	39		<u> </u>	13 47.50		131.68	4.43					
	-	1314	44			13.72.60		131.06	4.41					
ECT		1219				130+ 2.66	5	131.05	4.40					
PROJECT	-	1924				130+2,63		13103	4.72					
A I	-	1229						*		<u></u>				
	-	1234				130 + 2162		131.02	4.37	ļ				····
	$\vdash$	1239				13012,58		13078	4.33					
	-	1244				130+2.58		130.98	4.33					
	-	1249				130+2.59		130.99	4.34					
,	_	1254				120+2138		130.98	7.33					
		134	94			130+ 2.57		, <sup>7</sup> , <del>7</del> 7	4.32	L	لــــــــــــــــــــــــــــــــــــــ			

#### AQUIFER TEST DATA

PUMPING or OBSERVATION WELL

TYPE OF AQUIFER TEST A CONTROL OF THE PROPERTY	PUMPING OF RECOVERY DATA PAGE 2 OF 2
HOW W. L.'s MEASURED	DEPTH OF PUMP/AIRPIPE
MEAS. POINT FOR W.L.'S	PUMP OFF: date 1/4/1/3/6 time
ELEVATION OF MEAS. POINT	DURATION OF AQUIFER TEST

		t =	TIM		′= o	STATIC	WATER LEVEL DATA STATIC WATER LEVEL 126.65 (ADS)					HARGE	RDED	COMMENTS
	0	CLOCK		1'	-0		CONVERSIONS		s or \$'		DISCH	a	RECO	COMMENTS
	7	13:14:				130-2.54		130.94	4.22				B	
	17	12:24				130-2.57		130,73	4.28				1	
		13:34				13-252		130.92	1.27				"	
	$\vdash$	13.44				130,2.51		130.91	4.26					
		13:54	112			136-5,31		130,90	4.25					
	Г	14:04	1.4			1301 249		130.89	4.24					
	$\vdash$	1414	24			12-1.47		130.87	4.22					
		14.24	25.7			13 2.46		130.86	4.21					
		14 34	164			12 +2.44		130.84	4.P)					
		14 49	154			13/+ 2+2		130.82	4.17					
ني	Г	1504	214			130+2.40		130.80	4.15					
PERSONNEL		15 19	229			130+2.39		130.79	4.14					
SS.		15 34	244			1302.38		130.18	4.13					
PEF		15:49	-59			130+1.36		130.16	4.11					
_		16:14	274			130+2.34		130.74	4.00)					
	7	1.19	289			130 - 2.33		130.73	4.08					
	1	K.34	57			30-2.31		130,11	4.06					
1	/	11 49	319										•	
	L													
	Z	9:50				130+1.47								
	2	1550				130+1.10								
1	3	8:31				1304.07								
	3	13:21				125 + 4.78		90%						
	4	13:53				125+3.68								
	7	8:59				125+0.34								
	7	r 39				125+0.03								
	8	8.36				120+4.27								
	8													
	<u> </u>													
	L_													
	<u> </u>													
	_						,,							
	$\vdash$											.,		·
	_													
1	<u> </u>					<b></b>								
	_													
	_										<u> </u>			
	-													
	-													
	<u>_</u>													

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 24.29 - 35.84
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00264001 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.55 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 30.07 + 5.00 + 2.00 \* 2.31 = 39.69

R = BOREHOLE RADIUS = .16 FEET

P2/3 TEST

Q = INJECTION RATE = .00196308 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.55 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 30.07 + 5.00 + 3.50 \* 2.31 = 43.15

R = BOREHOLE RADIUS = .16 FEET

2ND P1/3 TEST

TEST ABORTED

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J.BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 24.65 - 35.84

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

K = ----- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

Q = INJECTION RATE = .00264001 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 30.24 + 5.00 + 2.00 \* 2.31 = 39.86

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000402 FT/MIN

K = .00000204 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00196308 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 30.24 + 5.00 + 3.50 \* 2.31 = 43.33

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000275 FT/MIN

K = .00000140 CM/SEC

2ND P1/3 TEST

TEST ABORTED

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 35.84 - 47.03

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

 $K = \frac{Q}{-----} LN(--)$ 2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00078523 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.43 + 5.00 + 2.00 \* 2.31 = 51.05

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000093 FT/MIN

K = .00000047 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00124554 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.43 + 5.00 + 5.50 \* 2.31 = 59.14

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000128 FT/MIN

K = .00000065 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00006769 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 41.43 + 5.00 + 2.00 \* 2.31 = 51.05

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN

K = .00000004 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 42.58 - 53.77

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

# K = ---- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00001354 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.18 + 5.00 + 2.00 \* 2.31 = 57.80

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00001354 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.18 + 5.00 + 8.00 \* 2.31 = 71.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN

 $K = .00000001 \, \text{CM/SEC}$ 

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 48.18 + 5.00 + .00 \* 2.31 = 53.18

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE; Q=0

ROCKY FLAT PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 70.96 - 82.15

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00287016 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 2.50 \* 2.31 = 87.33

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000200 FT/MIN

K = .00000101 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01111511 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 14.50 \* 2.31 = 115.05

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000587 FT/MIN

K = .00000298 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00476555 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 76.56 + 5.00 + 2.00 \* 2.31 = 86.18

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000336 FT/MIN

K = .00000171 CM/SEC

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PACKER TEST ANALYSIS
    WELL NO. 27-86
    PLANT JOB NO. 106P06222
E TESTED: 9/15/86 BY: J. BERGMAN
VAL (FEET BELOW G.S.): 70.96 - 82.15
L TESTED: ARAPAHOE CLAYSTONE
WATER (FEET BELOW G.S.): 129.14
  ----- LN(--)
  2(PI)(L)(H)
                 R
EST
 Q = INJECTION RATE = .00287016 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
         + GAGE PRESSURE (IN FEET)
         = 76.56 + 5.00 + 2.50 * 2.31 = 87.33
 R = BOREHOLE RADIUS = .16 FEET
 K = HYDRAULIC CONDUCTIVITY = .00000200 FT/MIN
                              K = .00000101 \text{ CM/SEC}
 Q = INJECTION RATE = .01111511 (FEET3/MIN)
 L = LENGTH OF TEST INTERVAL = 11.19 FEET
 TEST INTERVAL IS ABOVE WATER TABLE
     D = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
         + GAGE PRESSURE (IN FEET)
         = 76.56 + 5.00 + 14.50 * 2.31 = 115.05
  R = BOREHOLE RADIUS = .16 FEET
  K = HYDRAULIC CONDUCTIVITY = .00000587 FT/MIN
                              K = .00000298 \text{ CM/SEC}
EST
  Q = INJECTION RATE = .00476555 (FEET3/MIN)
  L = LENGTH OF TEST INTERVAL = 11.19 FEET
  TEST INTERVAL IS ABOVE WATER TABLE
 HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
         + GAGE PRESSURE (IN FEET)
         = 76.56 + 5.00 + 2.00 * 2.31 = 86.18
  R = BOREHOLE RADIUS = .16 FEET
  K = HYDRAULIC CONDUCTIVITY = .00000336 FT/MIN
                              K = .00000171 \text{ CM/SEC}
```

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 82.15 - 93.34
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

K = ----- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00054154 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 87.74 + 5.00 + 2.00 \* 2.31 = 97.36

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000034 FT/MIN K = .00000017 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .01650343 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 87.74 + 5.00 + 17.30 \* 2.31 = 132.71
R = BOREHOLE RADIUS = .16 FEET

2ND P1/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000074 FT/MINK = .00000038 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 96.43 - 107.62

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

K = ---- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00113723 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 2.00 \* 2.31 = 112.00

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000062 FT/MIN

K = .00000031 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 20.00 \* 2.31 = 153.57

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000041 FT/MIN

K = .00000021 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 2.00 \* 2.31 = 112.00

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 96.43 - 107.62 MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00113723 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 2.00 \* 2.31 = 112.00

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000062 FT/MIN

K = .00000031 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 20.00 \* 2.31 = 153.57

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000041 FT/MIN

K = .00000021 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 102.03 + 5.35 + 2.00 \* 2.31 = 112.00

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 107.62 - 118.81
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 113.21 + 5.35 + 2.00 \* 2.31 = 123.18 R = BOREHOLE RADIUS = .16 FEET

K = .00000001 CM/SEC

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN

P2/3 TEST

Q = INJECTION RATE = .00048739 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 23.00 \* 2.31 = 171.69
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000017 FT/MIN
K = .00000009 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00002708 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 11.19 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 113.21 + 5.35 + 2.00 \* 2.31 = 123.18
R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MINK = .00000001 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 107.62 - 118.81
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 129.14

K = ---- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 113.21 + 5.35 + 2.00 \* 2.31 = 123.18

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00048739 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 113.21 + 5.35 + 23.00 \* 2.31 = 171.69

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000017 FT/MIN

K = .00000009 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00002708 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 113.21 + 5.35 + 2.00 \* 2.31 = 123.18

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000001 FT/MIN

K = .00000001 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN TEST INTERVAL (FEET BELOW G.S.): 118.81 - 130.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = ---- LN(--)$$
  
2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00005415 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 124.40 + 5.35 + 2.00 \* 2.31 = 134.38

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00067693 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 124.40 + 5.35 + 26.00 \* 2.31 = 189.82

R = BOR\_HOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000022 FT/MIN

K = .00000011 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00008123 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 124.40 + 5.35 + 2.00 \* 2.31 = 134.38

R = BOREHOLE RADIUS =

K = HYDRAULIC CONDUCTIVITY = .00000004 FT/MIN

K = .00000002 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 130.00 - 141.19

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

O = INJECTION RATE = .00004062 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 2.00 \* 2.31 = 139.11

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00369601 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 27.50 \* 2.31 = 198.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000113 FT/MIN

K = .00000058 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00035200 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 2.00 \* 2.31 = 139.11

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000015 FT/MIN

K = .00000008 CM/SEC

WELL NO. 27-86

ROCKY FLATS PLANT JOB NO. 106P06222 DATE TESTED: 9/15/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 138.37 - 149.56

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 129.14

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00006769 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 3.00 \* 2.31 = 141.42

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00036554 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 30.50 \* 2.31 = 204.94

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000011 FT/MIN

K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 11.19 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 129.14 + 5.35 + 3.00 \* 2.31 = 141.42

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2786	09/30/86	5961.86	5963.26	1.40	133.00	111.2	5852.04
	10/01/86					130.6	5832.66
	10/13/86					130.5	5832.78
	10/17/86					129.4	5833.85
	10/21/86					127.5	5835.76
	10/28/86					124.2	5839.09
	11/05/86					123.1	5840.16
	11/07/86					131.6	5831.66
	11/26/86					115.9	5847.32
	01/01/87					78 <b>.7</b> 1	5884.55
	02/25/87					99.04	5864.22
	03/19/87					61.25	5902.01
	05/08/87					107.0	5856.22
	06/03/87					88.22	5875.04
	07/08/87					115.2	5848.11
	08/04/87					92.40	5870.86
	09/03/87					74.50	5888.76
	09/22/87					67.60	5895.66
	10/21/87					100.7	5862.56
	11/09/87					87.10	5876.16
	12/22/87					70.10	5893.16
	01/27/88					82.80	5880.46
	02/29/88					70.50	5892.76
	03/21/88					64.40	5898.86
	04/18/88					99.30	5863.96

SATURATED THICKNESS IN WELL # 27-86(SP) Apr-88 Jan-88 Oct-87 Jul-87 Apr-87 DATE Jan-87 PS-100 Oct-86 **-**Jul-86 Apr-86 Jan-86 100 90 80 70 9 20 20 40 30 O 9

SATURATED THICKNESS (ft.)

#### INDEX OF DATA

Boring No.: 28-86								
Comple	Completed as well? Yes							
Data in File								
<u>X</u>	Log of Borehole							
<u>X</u>	Well Construction Summaries							
	Well Development Summaries							
· _ X	Hydraulic Conductivity Test Data and Results							
	Packer Test Data and Results							
<u> </u>	Water Level Data							
Х	Saturated Thickness Hydrographs							

Project: LOG OF BORING NO. 28-86 Rocky Flats Plant Date Drilled 8/28/86 Coordinates Boring Method Hollow Stem Auger Ground Surface Elevation 5964 Penetration Resistance Other Depth Sample Graphic (feet) Type Log Elev. (feet) Material Description Tests (Blows/Inch) 20 40 20 ARTIFICIAL FILL 0-1.0'-Sample. Recovered 0.8/1.0'=80%. GRAVEL: grayish orange pink (5YR 7/2) to very pale orange (10YR 8/2) granite, quartzite and sandstone pebbles; sandy; silty, calcareous; poorly 0000 sorted; subangular to subrounded; unconsolidated; dry. 1.0-2.0'-Sample. Recovered 0.0/1.0'=0%. 2.0-4.0'-Sample. Recovered 1.5/2.0 = 75%. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; grayish orange (10YR 7/4) gravel layer from 3.5-4.0'; calcareous; poorly sorted; unconsolidated; dry. 4.0-5.5'-Sample. Recovered 1.5/1.5'=100%. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; white (N 9) fine silt layer at 4.9'; calcareous; dusky yellow green (5GY 5/2) fine-grained sand and silt layer from 5.4-5.5'; moderately sorted; unconsolidated; dry. 5.5-8.0'-Sample. Recovered 0.0/2.5'=0%. Remarks Logged by: T. Murphy Checked by: Project No. Hydro-Search, Inc. 106P06222 Page 1 of 2

Pro	Project: Rocky Flats Plant LOG OF BORING NO. 28-86									
	e Drilled 8		Coordinat	es urface Elevati	on 5964					
Elev. (feet)	Depth Ser (feet) Ty	rick Graphic rpe Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Cont on 20 40	Other Tests				
	8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		8.0-12.5'-Sample. Recovered 4.5/4.5'=100\$.  8.0-8.4'. GRAVEL: Same as above; trace silt and very light gray (N 8) sand; poorly sorted; subangular to subrounded; unconsolidated; dry.  ARAPAHOE FORMATION  8.4-12.5'. CLAYSTONE: pale olive (10YR 6/2) with dark yellowish orange (10YR 6/6) mottling; trace silt; thin coarse sand lense at 9.1-9.2'; slightly calcareous; weathered; damp.  12.5-15.5'-Sample. Recovered 3.0/3.0'=100\$. CLAYSTONE: pale olive (10YR 6/2) with dark yellowish orange (10YR 6/6) mottles; trace silt; weathered; grades downward into brownish gray (5YR 4/1) claystone; damp.							
	14		TOTAL DEPTH: 15.5'							
Proje	rks Logged	d by: T. Mu			Checked by:					
F10)(	106P0622	2	Hydro-Search,	Page 2 of 2						

w	ELL	28-8	6						
N SUMMARY									
GROUND LEVEL									
CTION	TIME I	LOG:	FIN	ISH					
	<u>DATE</u> 1986	TIME	<u>DATE</u> 1986	TIME					
	8/29	1007	8/29	1230					
XGGING:									
less	8/29	1532	8/29	1532					
		<del></del>							
EMENT: : : NT:	8/29 8/29 9/12	1530 1630 1325	8/29 8/29 9/18	1615 1632 1300					
e	8/29 8/29	1615 1515	8/29 8/29	1630 1530					

#### WELL CONSTRUCTION ELEVATION: LOCATION or COORDS: \_ N 37816.2 E 22137.1 DRILLING SUMMARY: CONSTRUC TOTAL DEPTH Well: 8.60' Hole: 15.50' TASK DRILLING: DRILLER Boyles Brothers Drilling Co. 7½" auger 15865 W. 5th Avenue Golden, CO (Dave Jarvie) Mobile B-57 RIG \_ GEOPHYS, LO CASING: BIT(S) \_ Colden, CO T. Murphy 2" stain! None DRILLING FLUID \_\_\_ SURFACE CASING 5" x 5' steel w/ locking FILTER PLAC CEMENTING: PERSONNEL WELL DESIGN: LOCATION LEVELCPMEN BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG \_\_\_ OTHER: CASING STRING(S): C = CASING S=SCREEN Bentonite 0.00' 4.03' Cl 4.03'- 8.60' SI WELL DEVELOPMENT See Well Development Summary Sheet. CASING: CI 2" I.D. Sch. 5 type 316 stainless steel threaded and flush Plant jointed. Rocky Flats SCREEN: SI 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen 0.25' welded bottom cap. No water encountered during drilling. CENTRALIZERS Type 304 stainless steel Top of stainless steel casing: 2.54' 6.75' - 5.55' - 16 PROJECT FILTER MATERIAL 32-42 silica sand Cave from TD to 15.10' 2.70' - 9.70' CEMENT Portland Type I 0.00' - 2.00' - 18 OTHER 3/8" bentonite pellets

HYDRO-SEARCH RENO-DENVER

2.00' - 2.70' 9.70' - 15.10'

20

CONSULTING HYDROLOGISTS-GEOLOGISTS



SHEET\_\_

CLIENT/SUBJECT	W.O. NO			
TASK DESCRIPTION			TASK NO	
PREPARED BY	DEPT	DATE	APPROVED BY	
MATH CHECK BY	DEPT	DATE		
METHOD REV. BY	DEPT	DATE	DEPT DATE	

WELL 28-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (4pm) = 0.069

Screened Interval (It below G.L.) = 6,19 (Static W.L.) - 9.96'

Note TD measured at time of test was 9.91 ft below Groundlevel This was used in analysis as Base of ecroened interval. TD. measured June 21, 1988 was 9.47 ft below Groundlevel.

Method of Analysis: Residual - drawdown Plot

(Driscoll, 1726 - pg 256.)

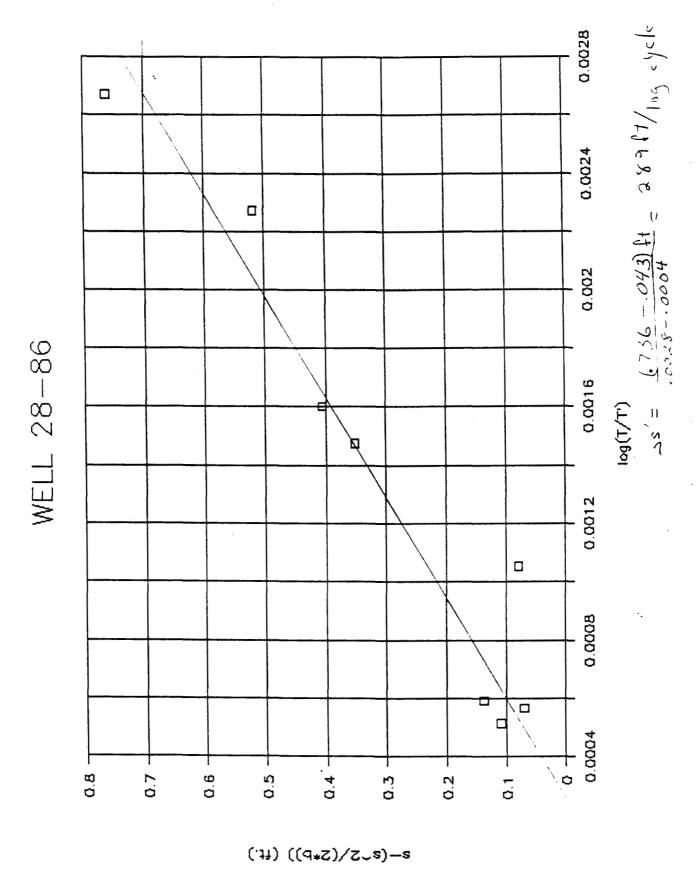
SHEET	of .

				SHEET of
CLIENT/SUBJECT			W.O. NO	<del></del>
TASK DESCRIPTION	· · · · · · · · · · · · · · · · · · ·		TAS	K NO
PREPARED BY			AP	PROVED BY
MATH CHECK BY				
METHOD REV. BY	DEPT	DATE	DEPT	DATE
	$\omega \epsilon_{L}$	L 28-86		
T (apd)fo	-) = 264	Q = 264 (.0 28	6,3	30 x/3-2
where	Q (apm)	) = 1 gallon/	14,5 min = C	0,0690gpm
	7.7	,		
	$\Delta S' = \frac{2}{2}t$	namoe in residua	I drawdown/	log cycle
	= 28	-9 At/Isacycle	see ittache	a plat)
K (gpd/ft	2) = T/	b = 6.30	× 10-2/5,8	$= 1.09 \times 10^{-2}$
whe	ere b (ft)	= 11,99 -D	) - 6.19 = 5.	S <sub>t</sub> ←
k (cm/se	e) = /,09x/0	-2 3 pd/ft 2 x 4.	72×10-5 = m/2e 9 Fd/ffe	= 5,1x10 <sup>-7</sup>
<del></del>				
inis met	ihod is Va	id where	u < 0.01	
•				٠.
solving	g for t	for u &	י וניכ	
<i>+</i> =	rz S	(30Z)Z (,1	)	min 7.482 a

= 1 T u = 4(1.09×10-2)(01) × 1440min 1.---

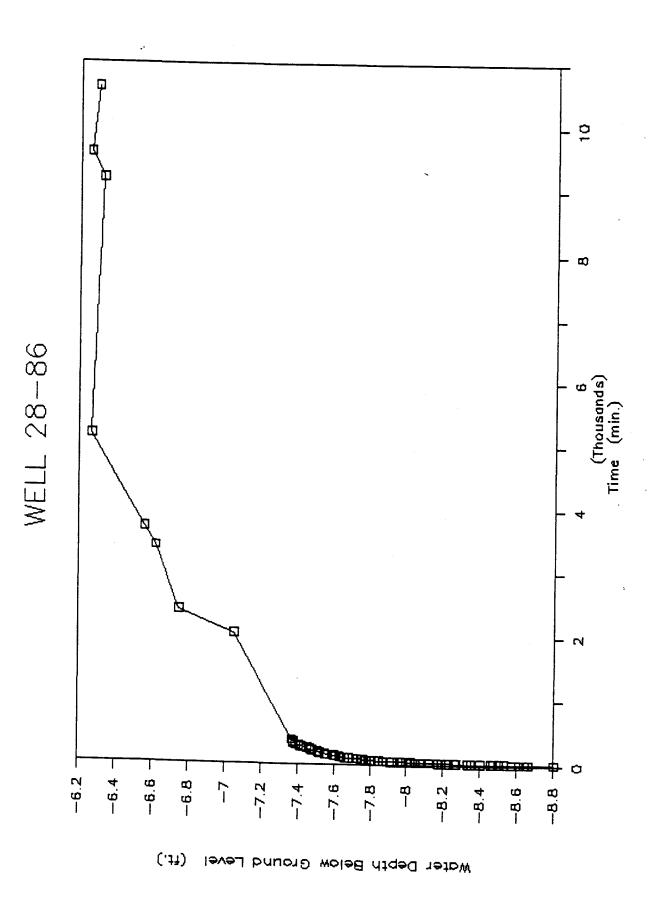
= 225,376 min,

where  $r(ft) = \left(\frac{7.25}{24}\right) ft = .302 ft$ J= 0.1 assumed S for unconfined aquiters. OS' is involed.



00000 WELL 28-86 0.7

('11) ((q\*Z)/Z~s)-s



T Time (min.)	T' T Prime (min.)	Water	WELL 28-86 s' Rsd Drwdn (ft.)	s-(S^2/2b) b=2.41 ft. (ft.)	log(T/T')
Time	T Prime	Level	Rsd Drwdn (ft.)  2.61 2.47 2.45 2.42 2.38 2.34 2.31 2.28 2.27 2.21 2.16 2.14 2.08 2.07 2.04 2.03 2.00 1.98 1.93 1.89 1.86 1.83 1.81 1.79 1.78 1.73 1.72 1.68 1.66 1.61 1.59	b=2.41 ft. (ft.)  1.71 1.66 1.65 1.64 1.63 1.61 1.59 1.56 1.54 1.53 1.51 1.50 1.48 1.47 1.46 1.44 1.42 1.40 1.39 1.38 1.37 1.36 1.33 1.31 1.29 1.27 1.25	0.58 0.54 0.51 0.49 0.47 0.44 0.39 0.38 0.36 0.34 0.32 0.20 0.28 0.27 0.26 0.24 0.23 0.22 0.21 0.19 0.18 0.17 0.16 0.15 0.14 0.13 0.13 0.12 0.11 0.09 0.08
81.00 86.00 91.00 96.00 101.00 111.00	68.50 73.50 78.50 83.50 88.50 98.50 108.50	7.76 7.75 7.73 7.68 7.66 7.64	1.57 1.56 1.54 1.49 1.47	1.24 1.24 1.23 1.20 1.18 1.17	0.07 0.07 0.06 0.06 0.06 0.05

T	T'	Water	WELL 28-80		10~(m/m!)
Time	T Prime	Water Level		$s-(S^2/2b)$ b=2.41 ft.	log(T/T')
(min.)	(min.)	(ft.)	(ft.)	(ft.)	
(111111)	( )	(10.)	(10.)	(10.)	
131.00	118.50	7.61	1.42	1.15	0.04
141.00	128.50	7.60	1.41	1.15	0.04
151.00	138.50	7.56	1.37	1.12	0.04
161.00	148.50	7.55	1.36	1.11	0.04
171.00	158.50	7.52	1.33	1.10	0.03
181.00	168.50	7.52	1.33	1.10	0.03
191.00	178.50	7.51	1.32	1.09	0.03
201.00	188.50	7.51	1.32	1.09	0.03
216.00	203.50	7.48	1.29	1.07	0.03
231.00	218.50	7.47	1.28	1.06	0.02
246.00	233.50	7.45	1.26	1.05	0.02
261.00	248.50	7.45	1.26	1.05	0.02
276.00	263.50	7.42	1.23	1.03	0.02
291.00	278.50	7.41	1.22	1.02	0.02
306.00	293.50	7.39	1.20	1.01	0.02
321.00	308.50	7.38	1.19	1.00	0.02
336.00	323.50	7.38	1.19	1.00	0.02
351.00	338.50	7.38	1.19	1.00	0.02
381.00		7.37	1.18	1.00	0.01
2039.00		7.05	0.86	0.76	0.00
2397.00	2384.50	6.75	0.56	0.52	0.00
3396.00	3383.50	6.62	0.43	0.41	0.00
3689.00	3676.50	6.56	0.37	0.35	0.00
5159.00		6.27		0.08	0.00
9188.00		6.33	0.14	0.14	0.00
9588.00	9575.50	6.26	0.07	0.07	0.00
10605.00	10592.50	6.30	0.11	0.11	0.00

# AQUIFER TEST DATA

	 	THE OF AC	ZOIFER ZOIFER	1521		ik wax x.	2004. 70.	-			PU	MPING	or RE	OF
للعلاير		DW W. L. 's	MEAS	URED -		-4 5m - Clari U	esc		DEPTH OF	PUMP/A			_	UF
KIN DAN!		AD./DIST.	OF/FRO	M PUMP	ING WE	ш/							tır	ne
10:04:30	) MI	EAS. POI	NT FOR	W.L.'s -					PUMP OFF:	date	11-1-5			me
1013	El	EVATION	OF MEA	S. POIN	1T <u> </u>	= a.03	Cast of	coment	DURATION	OF AQUIE	FER TES	T		
11	Γ		TIN	1E		= a,03	WATE	RLEVEL	DATA	6.19			8	(
		t=		at t		STATIC	WATER L	EVEL	+ 3.22 -	2,03	DISCH	HARGE	<b>2</b> ≻	COMMENTS
	0	CLOCK		l'		25.000	CONVERSIONS	WATER	,		READ-		ECO B	COMMENTS
	9	TIME	Ł	1		READING	CONVERSIONS CONRECTIONS	LEVEL	3 OF 8'		ING	Q	æ	T.D. 11. 9: MA 207.
	$\angle$	N.O.	رةرا			10+.83	-2.03	8.8	10.6					
	L	10:05:30	1	<u> </u>	<u> </u>	10+.69	-2.03	8,66	2.97					Bur 1 pe
	L	10:05	1.5			10+.67	, 1	8.64	a.45					
	L	10:06:13	2			10+.64	11	8.61	2,42					Finished beans
		10:04	z.5			10+.60	11	8,57						10:04:30
	Г	10:67:5	<b>5</b> 3			10+.56		8.53	ا 34					
		10:08				10+.53		2,5	3,31	,				started bailing
	Г	0:08:3				Dr.50		8.47						9:48
		10:09				b+.49		8.46	2.27					7.10
1 1		10:09:				101.43		8.40	2,21					<u> </u>
نے ا	7	10:10	6			lot 43		8,40	2,21			-	1	3.0
NE N	-	10:11	<u> </u>			lot. 38		8,35	2,16		100	quivy	<i>Y</i>	Dh Dec - 8.48
SON	十	10:12	3					8.303	2.113		1 300	, ,		10 Ea (1)0
LOCATION PERSONNEL	-		9			104.33								
ے د	-	10'13	10			10+.333			2,113				-	
	-	10:4				10+.30		8.27	2.08		-			
	$\vdash$	10:15	1		<del></del>	10+ 29		8.26	2.07					<u> </u>
	-	10:16	12			10+.26		8.23	2.09					
	$\vdash$	10:17	13			10+.25		9.22	2.03		-		-	
1 1	$\vdash$	10:18	<u>)4</u>			10+,22		5.19	20					
	<del>-</del>  -	10:19	.5			10+,20		8.17	1.18					
	$\vdash$	10:36	ΙŦ			10+.15		8.12	1.93		1			
	-	10:23	19			10+.11		8.08	1.89					
	-	10:25	ō.			10+.08		8.05	1.86	···				
	<u> </u>	10: a7	à3			10 +.05		8.02	1.63					
	L	b: 29	25			10 4.05		8.02	1.83					÷
1 1	_	10:31				10 +.03		800	1181					
	L	10: 33				10 +.01		7.90	1,79			·		
	<b>L</b>	10: 35	_31			104.00		7.97	1.78					
	L	0:37				10+05		7.92	1.73					
	L	10:39	<u> 35</u>			10-06		7.91	1.72					
	L	10:44	අත			10-10		7.87	1,68					
		10:07	45			1012		7.85						
15		ID:54	50			10-, 17		7.8	1461					
J.E.		vo:59	55			10-19		7.78	1.59					
PROJECT		10:04	5O			1020		7.77	1.58			$\neg \neg$		<del></del>
• '	Г	11:09	65			1021		7.76					$\dashv$	
		m: 14	70			10-,22		7175	1.56					
		11.19	75			10-24		7,73	1,54			一十		
		11:24	80			10-,29		7.69	1,49					
		11: 24	85			10-315		7.659					一十	
	-	<del>+++ ~ 7  </del>				112 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	1	11623			<u>_</u>	1		

HYDRO-SEARCH RENO DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

#### AQUIFER TEST DATA

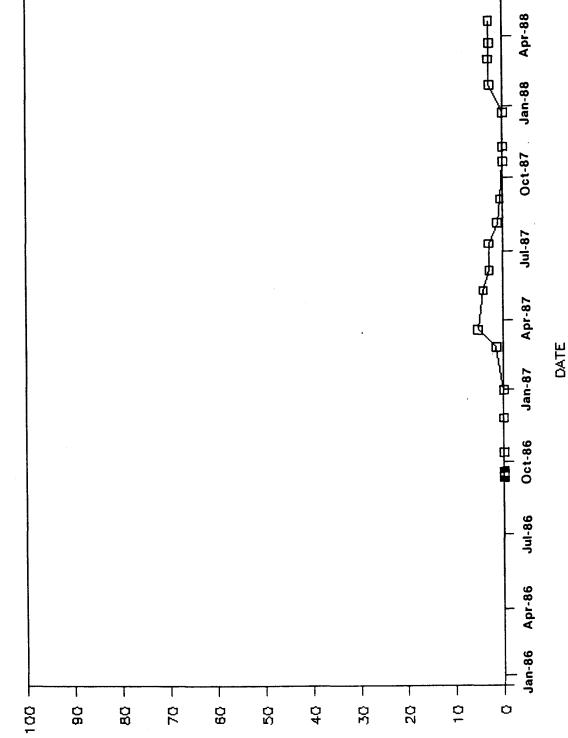
PUMPING or OBSERVATION WELL PUMPING OF RECOVERY DATA

R	AD IEA	./DIST. IS. POIN	OF/FROI IT FOR V	RED M PUMPING W V.L.'s S. POINT	/ELL			PUMP ON: PUMP OFF:	pump/AIRPIPE  date //-//-86  data //-//-86  OF AQUIFER TEST		time 9:48:48 time 10:04:30		
ſ	TIME t= at t'=0				STATIC	WATER LEVEL			DATA		ARGE	ROED	COMMENTS
1	2	CLOCK		1'		CONVERSIONS		s or s'		READ-	a	RECO	COMMENT
٢	_	1149	<b>D</b> 5		0-,34		7.63	1,44	<del></del>	1			
Γ	т	1159	_115		10365	T	7.605						
Γ	1	1209	125		10-375		7.595						
Γ	$\exists$	13.19	135		10-4	,	7.56	1,37					
Γ	T	1229			10- 125		7,545						7: -
Γ	Т	3.79	153		10-,45		7.52	1,33					
Γ	$\neg$	D 19	1/55		1045		7,32						
Γ	$\top$	1359	175		104		7.51						
Γ	T	E 09			10 Abs			1,315		<u> </u>			
Τ	T	24	500		10-495	<del></del>	7.475						<del></del>
Γ	1	334	315		10-,50		7,47	1,28					
Γ	T	3.54	<u>&amp;50</u>		10-,52		7,45	1,26		<del>                                     </del>			
	1	409	645		10-,525		7,445	1,255					
Γ	T	14 24	350		10-55		7.42	1, 23					
Γ	_	14 39			10-516		7.405	1. 315					
Г	_		690		10- 58		7,385						
Γ	_		305		n594		7,38	1.190					
Γ	_	15 24			10590		7.3B	1,190					
			335		10590		7.38	1.19					·
D			ā 65		1060		7.37	1,18					
Γ	7				10.100		$T1 \cup T$	-1110					
12	2	9.47			5+4.08	-203							
2		18.45			5+ 3.78								
3	3	8:24			5+365								
1	3	13.17			5+3.59		90	4					
4	2	13:47			5+3,30								
_		8:56			5+3.36							T	
7	-	5.36			5+ 3.29								<del>-</del>
$\mathcal{Z}$	_	8:33			5+ 3.53							$\neg \uparrow$	
8					3,0.0								
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# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2886	09/12/86	5961.23	5963.77	2.54	8.60	10.54	5953.23
	09/13/86					10.67	5953.10
	09/15/86					10.36	5953.41
	09/16/86					10.78	5952.99
	09/17/86					10.80	5952.97
	09/18/86					10.63	5953.14
	10/13/86					9.10	5954.67
	11/26/86					8.51	5955.26
	01/01/87					8.79	5954.98
	02/25/87					7.00	5956.77
	03/19/87					3.25	5960.52
	05/08/87					4.38	5959.39
	06/03/87					5.73	5958.04
	07/08/87					5.65	5958.12
	08/04/87					7.40	5956.37
	09/03/87					8.00	5955.77
	10/21/87					8.90	5954.87
	11/09/87					8.70	5955.07
	12/22/87					8.70	5955.07
	01/27/88					5.80	5957.97
	02/29/88					5.60	5958.17
	03/21/88					5.80	5957.97
	04/18/88					5.70	5958.07

28-86 (SP) SATURATED THICKNESS IN WELL # 



SATURATED THICKNESS (ft.)

#### INDEX OF DATA

Boring No.: 29-86							
Completed as well? Yes							
Data in File							
X Log of Borehole							
X Well Construction Summaries							
Well Development Summaries							
Hydraulic Conductivity Test Data and Results							
Packer Test Data and Results							
X Water Level Data							
X Saturated Thickness Hydrographs							

Project: Rocky Flats Plant

### LOG OF BORING NO. 29-86

Date Drilled 9/9/86

Boring Method Hollow Stem Auger

Coordinates N 37610.3 E 22584.1 Ground Surface Elevation 5958.26

Elev. (feet)	Depth Sample Graphic (feet) Type Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Content Content 20 40	Other Tests
	0 / 000	ROCKY FLATS ALLUVIUM			
	1 600	0.0-2.0'-Sample.		-	
	6000	Recovered 0.5/2.0'=25%.		_	
	1 7/100	GRAVEL: grayish brown		_	
	7/2:00	(5YR 3/2) to dusky brown (5YR 2/2) granite and		_	1
	200.5	quartzite pebbles and			ł
		cobbles; sand and silt			1
	1/ / %:: (	<pre>matrix; bimodal sorting; subangular;</pre>		_	1
	-/ P:00	unconsolidated; loose;	•	_	i
	1/1000	damp.		-	ł
	. 7 / 15°6's	2.0-3.6'-Sample.		_	į .
		Recovered 1.6/1.6'=100%.			1
	1//:30	GRAVEL: moderate brown	1		}
	1 -1/10:73	(5YR 4/4) granite and		_	1
	1 // 100	quartzite pebbles and cobbles; sandy; some silt;		-	1
	1/1000	poorly sorted; subangular;		-	i
		well packed; damp.	1	-	1
		3.6-6.5'-Sample.		_	1
		Recovered 0.0/3.0'=0%.		_	1
		Cuttings. GRAVEL: light	l		
	-//	brown (5YR 5/6) granite and quartzite pebbles and			1
		cobbles; unconsolidated;	1	-	1
		dry.	1	-	1
		6.5-7.5'-Sample. GRAVEL:		-	4
		light brown (5YR 6/4)	1		1
		granitic pebbles and			1
	1 1/1	cobbles; medium to coarse sand; poorly sorted;			1
	-//	angular; unconsolidated;	1		1
	4//	dry to damp.		•	1
		7.5-12.5'-Sample.		•	1
		Recovered 4.3/5.0'=86%.	1	-	4
	] ]//::::		1	٠.	4
		7.5-8.7'. CLAY: olive gray (5Y 3/2) and grayish			1
	1 1/1	brown (9YR 2/2); gravelly;	1	_	1
	<b>一</b> 15 <b>一</b> ∕	some sand and silt;	1	1	
	1 4/凝禁	caliche stringers; soft;	1	1	7
	1 4/1		1	1	1
	1 1/1	1			1
					-1
	1 7/	ARAPAHOE FORMATION			4
	1 7/	8.7-12.5'. CLAYSTONE:	· [		4
		yellowish gray (5Y 7/2) to		١.	1
	1 1/1	dusky yellow (5Y 6/4);			L
	1 7/1	silty; weathered; firm; moist.	1.	1	7
	1 +/ /				7.
Ren	narks Logged by: T.	Murphy		Checked by	the
	eject No.		1		
	106P06222	Hydro-Search	, INC.	Page 1 of 2	2

Project: Rocky Flats Plant

## LOG OF BORING NO. 29-86

Date Drilled 9/9/86

Coordinates N 37610.3 E 22584.1

Bori	Boring Method Hollow Stem Auger Ground Surface Elevation 5958.26								
Elev. (feet)	Depth Semple (feet) Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content 20 40	Other Tests			
	20 		12.5-17.5'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: pale olive (10Y 6/2) with dark yellowish orange (10YR 6/6) mottling; fine-grained to Coarse-grained sand stringers; occasional calcite in fractures (dark yellowish orange 10YR 6/6); 50% sand and 50% claystone; firm; moist.  17.5-22.5'-Sample. Recovered 2.0/5.0'=40%. SANDSTONE: dark yellowish orange (10YR 6/6) and light gray (N 7); silty; some clay; moist; soft.  22.5-25.5'. Lost core.  TOTAL DEPTH: 25.5'						
Remar	2055600 07	: T. Mur	phy		Checked by:				
Projec	106P06222		Hydro-Search,	Inc.	Page 2 of 2				

WELL	2 <del>9-</del> 86	

		-0		8	WELL CONSTR	RUCTION S	UMM	ARY		
				Ö	LOCATION or COORDS:	ELEVATION: GROUP	ND LEVEL		5958	.26'
				39	N 37610.3 E 22584.1	TOP O	F CASIN	<b>G</b> 59;	59.95 <b>'</b>	
1	ı	_ 5		Be	Bout the command	CONCEDUCTION				
					DRILLING SUMMARY:	CONSTRUCTION			EIN	164
ı				13	TOTAL DEPTH Well: 8.77' Hole: 22.50'	TASK		ART	FIN	<u>13 H</u>
					BOREHOLE DIAMETER	COULLING.	DATE 1986	TIME	<u>DATE</u> 1986	TIME
		-10	#####	# <b>E</b>	DRILLER Boyles Brothers Drilling Co.	DRILLING: 7½" auger	9/9	1230	9/9_	_1410
					Golden, CO (Dave Jarvie)					
				荳	RIGMobile B-57	GEOPHYS. LOGGING:				
8	$\rightarrow$				BIT(S)	CASING:				
•	Murphy	-15				2" stainless	9/9	1550	9/9	1552
Colden,	Σ			臣	DRILLING FLUID None					
٥				돏	SURFACE CASING 5" x 4' steel w/ locking	FILTER PLACEMENT	9/9	1600	9/9	1605
	ا					CEMENTING:	9/9	1610	9/9	1615
Š,	Š	20			WELL DESIGN:	DEVELOPMENT:	9/12	1410	9/12	1410
OCATION	PERSONNEL	20			BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:				
207	PER		<u></u>		CASING STRING(S): C=CASING S=SCREEN	<u>Bentonite</u>	9/9	1605	9/9	1610
-					0.00' 2.83' Cl		9/9	_1540_	<u>9/9</u>	1542
		25								
1										
		l				WELL DEVELOR	MENT			
						,				
		<del>-</del> 30				See Well Deve	loppent	Summary	Sheet.	
					CASING: C1 2" I.D. Sch. 5 type 316 stain-	<del></del>	<del></del>			<del></del>
	Plant				less steel, threaded and flush iointed.				<del></del>	
	- 1				JOHNEU.				-	
7	ats	35			SCREEN: SI 2" I.D. Sch. 5 type 316 stain-					
106P06222	Rocky Flats	,,,		11	less steel, threaded and flush	COMMENTS:				
96P	श्र				jointed, 0.010" wire wrap screen			, <i>,</i>	3 '11'	
	2				0.25' welded bottom cap.	No water enco	intered	during	drillin	g.
					CENTRALIZERS Type 304 stainless steel 5.00' - 6.20'	Top of stainle	ess ste	el casir	ng: 1.6	91
  -		<b> </b> 40								
PROJECT					FILTER MATERIAL 32-42 silica sand	Cave from TD to	20,30	!		
PR	l				2.50' - 9.10'  CEMENTPortland Type I					<del> </del>
		45			0.00' - 2.00'			······································		
		۲			OTHER 3/8" bentonite pellets					
					2.00' - 2.50'					
					9.10' - 20.30'					
				1 1		<u> </u>	· . · · · · · · ·			

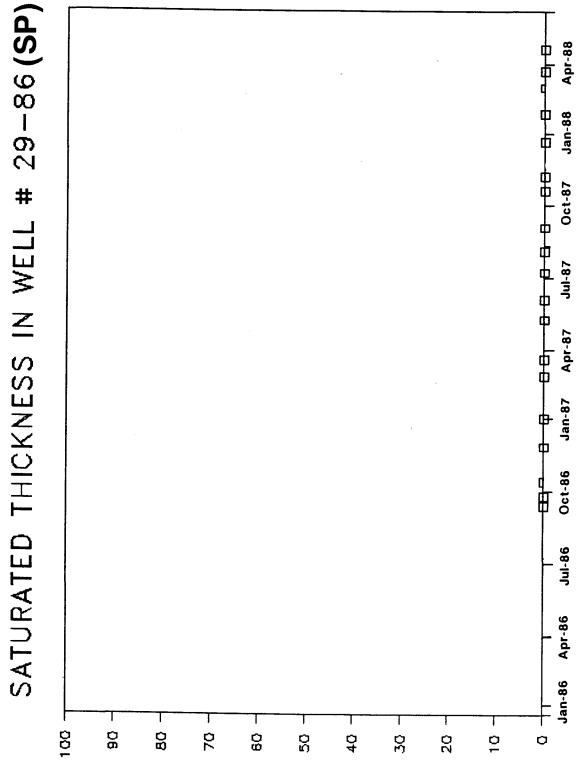
HYDRO-SEARCH RENO\*DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL Number	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2986	09/12/86	5958.26	5959.95	1.69	8.77	-1.00	DRY
	09/24/86					-1.00	DRY
	09/24/86					-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/19/87					-1.00	DRY
	05/08/87		,			8.85	5951.10
	06/03/87					9.82	5950.13
	07/08/87					-1.00	DRY
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/22/87					-1.00	DRY
	01/27/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

sATURATED THICKNESS (ft.) 5 8 8 6 8 8 8 8 8 8 8



DATE

#### INDEX OF DATA

Boring No.: 30-86						
Completed as well? Yes						
Data in File						
X Log of Borehole						
X Well Construction Summaries						
Well Development Summaries						
X Hydraulic Conductivity Test Data and Results						
Packer Test Data and Results						
X Water Level Data						
x Saturated Thickness Hydrographs						

Project: Rocky Flats Plant

### LOG OF BORING NO. 30-86

Date Drilled 9/6/86

Boring Method . Hollow Stem Auger

Coordinates N 38092.5 E 21819.6 Ground Surface Elevation 5956.21

Boring Method . Hollow Stem Auger Ground Surface Elevation 5956.21							
Elev. (feet)	Depth (feet)	Semple Type		Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	0 -		00.00	ARTIFICIAL FILL			
	-			0.0-2.0'-Sample. Recovered 1.2/2.0'=60%.		_	
		$\overline{//}$		0.0-0.8'. GRAVEL: granite and quartzite		-	
				<pre>pebbles; sandy; silty; poorly sorted; wet.</pre>			
	_			0.8-2.0'. CLAYSTONE: dusky brown (5Y 2/2) and		$\overline{}$	
	_			olive gray (5Y 3/2); silty; moist to wet.			
	5			ARAPAHOE FORMATION		_	
	-			2.0-4.0'-Sample. Recovered 2.0/2.0'=100%.		_	
				CLAYSTONE: light olive gray (5Y 5/2); some dark			
				yellowish orange (10YR 6/6) iron staining;		_	
	-			slightly calcareous; silty; firm; moist.		_	
				4.0-6.0'-Sample.		_	
	_			Recovered 2.0/2.0'=100%. CLAYSTONE: light olive		<del>-</del>	
	10			gray (5Y 5/2); some dark yellowish orange (10YR			
	10 —			6/6) iron staining; fragments of calcite; some		-	
	_			light olive gray (5Y 5/2) fine-grained sand; soft to moderately firm; moist.		-	
	_			6.0-11.0'-Sample.		_	
	_			Recovered 5.0/5.0'=100%. CLAYSTONE: light olive		_	
	_	//		gray (5Y 5/2); some dark yellowish orange (10YR			
	_			6/6) iron stains; calcite concretion at 6.3'; firm;		_	
	-	V/		damp.		-	
	— 15 —			11.0-16.0'-Sample. Recovered 5.0/5.0'=100%.		_	
	_			CLAYSTONE: olive gray (5Y 3/2) to olive brown (5Y 4/4); firm; damp.		_	
	-	1		TOTAL DEPTH: 16.0'	-	_	1
	-	1		***************************************		_	
	-	1				-	
		1				-	
	20	-			1,,,,		
Rema		ogged b	y: T. M.	ırphy		Checked by:	ALK
Proj	ect No.	-			Inc		
	106P0	06222		Hydro-Search,	1110.	Page l of l	

WEL	30-86	

WELL CONSTRUCTION SUMMARY ELEVATION: GROUND LEVEL \_\_\_\_5956.21 \* LOCATION or COORDS: \_ N 38092.5 E 21819.6 **DRILLING SUMMARY:** CONSTRUCTION TIME LOG: FINISH START TOTAL DEPTH Well: 14.93' Hole: 16.00' TASK DATE 1986 BOREHOLE DIAMETER \_ TIME TIME DRILLING: Boyles Brothers Drilling Co. 7년" auger 1430 9/6 1200 9/6 DRILLER\_ 15865 W. 5th Avenue Golden, CO (Dave Jarvie) Mobile B-57 GEOPHYS. LOGGING: RIG -Blade bit 8 BIT(S) \_ CASING: Murphy 9/6 1630 9/6 1635 2" stainless\_ Golden. DRILLING FLUID \_\_\_\_None SURFACE CASING 5" x 4' steel w/ locking 9/6 1635 9/6 1650 FILTER PLACEMENT 9/6 9/6 1700 1650 CEMENTING: PERSONNEL WELL DESIGN: 9/12 1030 1010 9/19 .8 LOCATION CEVELOPMENT: BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG \_ OTHER: 9/6 1642 Bentonite 9/6 1641 CASING STRING(S): C=CASING S=SCREEN 0.00' 2.48' C1 9/6 1625 9/6 1630 2.48'- 14.93' S1 10 WELL DEVELOPMENT See Well Development Summary Sheet. **H**2 CASING: CI 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush ant jointed. Ы Rocky Flats SCREEN: SI 2" I.D. Sch. 5 type 316 stain-106P06222 less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen 0.25' welded bottom cap. No water encountered during drilling. CENTRALIZERS Type 304 stainless steel Top of stainless steel casing: \_16 FILTER MATERIAL 32-42 silica sand Cave from TD to 15.60' 2.20' - 15.10' CEMENT Portland Type I 0.00' - 2.00' -18 OTHER 3/8" bentonite Bellets 2.00' - 2.20'

HYDRO-SEARCH RENG-DENVER

15.10' - 15.60'

-20

CONSULTING HYDROLOGISTS-GEOLOGISTS



CLIENT/SUBJECT	W.O. NO			
TASK DESCRIPTION			TASK NO	
PREPARED BY	DEPT	DATE	APPROVED BY	
MATH CHECK BY	DEPT	DATE		
			252	

WELL 30-86

Method of Analysis: Residual-drawdown Plot (Driscoll, 1986 - pg 256).

SH	CET	•	-4	
эп	EEI		OI	

CLIENT/SUBJECT			W.O. NO		
TASK DESCRIPTION			TASK NO		
			APPROVED BY		
MATH CHECK BY	DEPT	DATE			
METHOD REV. BY	DEPT	DATE	DEPT DATE.		
		<u>.</u> .			

WELL 30-86

K (2m/see) = 0.0183 gpd/ft2x 4.72×10-5=m/see = 8.6×10-7

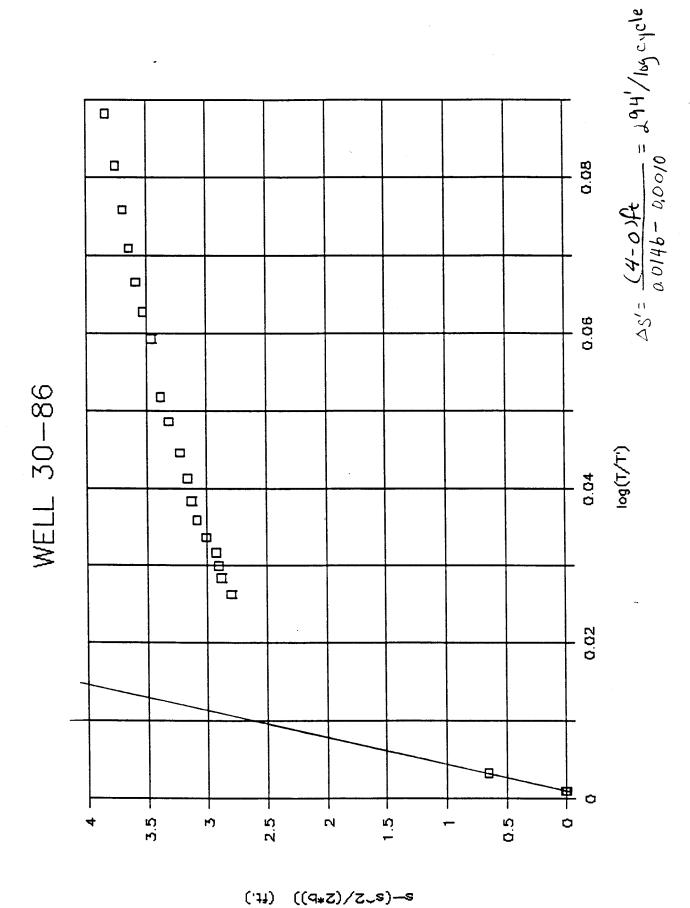
This method is valid where u < 0.01 solving for t for u < 0.01.

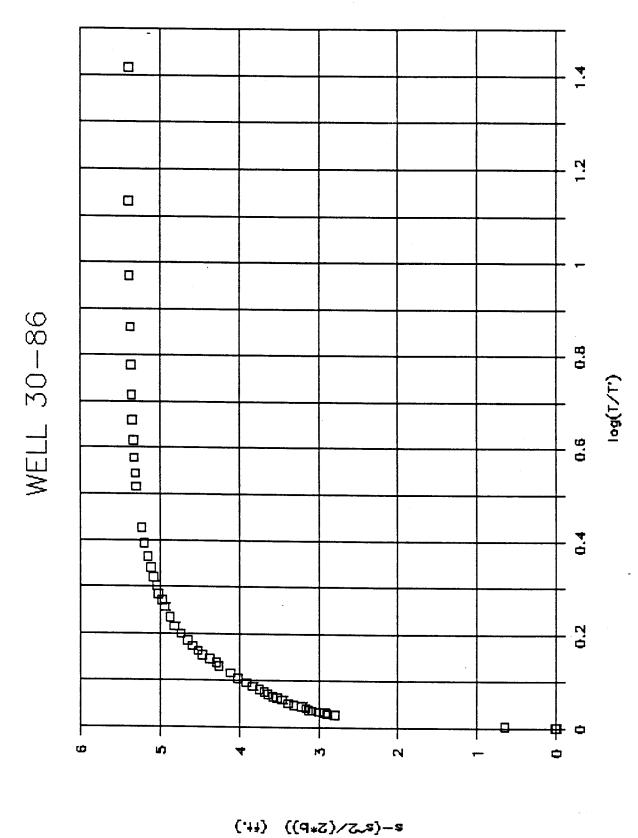
$$t_{min} = \frac{r^2 S}{4 T u} = \frac{(.3)^2 .1}{4 (0.198) (.01)} \times \frac{1440 min}{4 min} \times \frac{7.482 cal}{4 min}$$

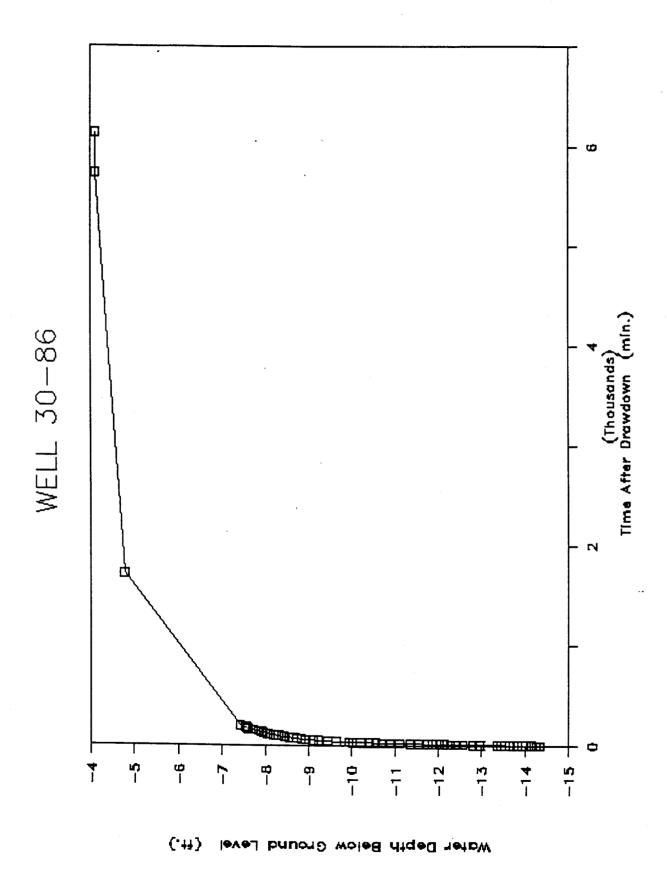
$$= 12,243 min$$

$$where  $r(4t) = (\frac{7.25}{24}) ft = (.30) ft$ 

$$S = 0.1 \quad assumed \quad S \quad for unconfined a quiters.$$$$







T	T'	Water	WELL 30-86	s-(s^2/2b)	log(T/T')
Time	T Prime	Level		b=10.82 ft.	
(min.)	(min.)	(ft.)	(ft.)	(ft.)	
,,	(	(,	(201)	(10.)	
13.00	0.50	14.34	10.23	5.39	1.41
13.50	1.00	14.26	10.15	5.39	1.13
14.00	1.50	14.15	10.04	5.38	0.97
14.50	2.00	14.01	9.90	5.37	0.86
15.00	2.50	13.93	9.82	5.36	0.78
15.50	3.00	13.83	9.72	5.35	0.71
16.00	3.50	13.73	9.62	5.34	0.66
16.50	4.00	13.63	9.52	5.33	0.62
17.00	4.50	13.53	9.42	5.32	0.58
17.50	5.00	13.44	9.33	5.31	0.54
18.00	5.50	13.35	9.24	5.29	0.51
20.00	7.50	12.95	8.84	5.23	0.43
21.00	8.50	12.79	8.68	5.20	0.39
22.00	9.50	12.56	8.45	5.15	0.36
23.00	10.50	12.41	8.30	5.12	0.34
24.00	11.50	12.28	8.17	5.09	0.32
25.00	12.50	12.13	8.02	5.05	0.30
26.00	13.50	12.03	7.92	5.02	0.28
27.00	14.50	11.87	7.76	4.98	0.27
28.00	15.50	11.76	7.65	4.95	0.26
30.00	17.50	11.53	7.42	4.88	0.23
32.00	19.50	11.36	7.25	4.82	0.22
34.00	21.50	11.11	7.00	4.74	0.20
36.00	23.50	10.88	6.77		0.19
38.00	25.50	10.72	6.61	4.59	0.17
40.00	27.50	10.55	6.44	4.52	0.16
42.00	29.50	10.41	6.30	4.47	0.15
44.00	31.50	10.20	6.09		0.15
46.00	33.50	10.01	5.90	4.29	0.14
48.00	35.50	9.94	5.83	4.26	0.13
53.00	40.50	9.64	5.53		0.12
58.00	45.50	9.44	5.33		0.11
63.00	50.50	9.23	5.12		0.10
68.00	55.50	9.09	4.98	3.83	0.09
73.00	60.50	8.94	4.83	3.75	0.08
78.00	65.50	8.83	4.72	3.69	0.08
83.00	70.50	8.74	4.63	3.64	0.07
88.00	75.50	8.64	4.53	3 <sup>.</sup> .58	0.07
93.00	80.50	8.55	4.44	3.53	0.06
98.00	85.50	8.44	4.33	3.46	0.06
111.00	98.50	8.31	4.20	3.38	0.05
118.00	105.50	8.20	4.09	3.32	0.05

т	T'	Water	WELL 30-86	s-(s^2/2b)	log(T/T')
Time	T Prime	Level	_	b=10.82 ft.	109(1/1 /
(min.)	(min.)	(ft.)	(ft.)	(ft.)	
128.00	115.50	8.05	3.94	3.22	0.04
138.00	125.50	7.96	3.85	3.17	0.04
148.00	135.50	7.91	3.80	3.13	0.04
158.00	145.50	7.84	3.73	3.09	0.04
168.00	155.50	7.72	3.61	3.01	0.03
178.00	165.50	7.60	3.49	2.93	0.03
188.00	175.50	7.57	3.46	2.91	0.03
198.00	185.50	7.54	3.43	2.89	0.03
213.00	200.50	7.42	3.31	2.80	0.03
1725.00	1712.50	4.78	0.67	0.65	0.00
5748.00	5735.50	4.12	0.01	0.01	0.00
6147.00	6134.50	4.11	0.00	0.00	0.00

- \$

#### ACHIEFR TEST DATA

TYPE OF AQUIFER TEST BALL DEW RECE TEST HOW Q MEASURED 4 GM BUCKET HOW WILL OF MEASURED TOWNS	PUMPING PAGE	PUMPING OF OBSERVATION WELL PUMPING OF ECOVERY DATA PAGE OF 2		
HOW W. L.'S MEASURED MANUE  RAD. / DIST. OF/FROM PUMPING WELL  MEAS. POINT FOR W.L.'S  FLEVATION OF MEAS. POINT	DEPTH OF PUMP/AIRPIPE  PUMP ON: date	time time	9:37	

	ΕL	EVATION	OF ME	S. POIN	IT	DURATION OF AQUI								
	TIME t = at t' = o					STATIC	STATIC WATER LEVEL 5+ 6 NOT MOTE			DISCHARGE		RECORDED BY		
	0 4	CLOCK	t	t'			COMPETIONS		s or s'		READ-	o	RECO	COMMENTS
	1	9:40				15+.89	1.50	14.34	10.23				CW	=
		9:40/5				15+.96	1.50	14.26	1015					9:29 start 1
		9:41				15+.65	1.50	14.15	10.04					9:39:30 finish 1
		1:41/2				15+,61		14.01	9.90					,
	L	2:12				15+.43		13.93	9.82					rec: 2.75
	L	9:42/2				15+,33		13.83	9.72					ga
		9:13				15+23		13.73	9.62				ay draw	
1		43/2				15+.13		13.63	9.52					·
	L	44				15+.05		13.53	9,42					
	L	44/2				10+4.94		13.44	933				i	
=	1	45-				10+485		13.35	9.24				•	15.84
PERSONNEL	1_	46_				10 North	<b>-</b>							5.61
PERSONN	$\vdash$	47				1241,45		12.95	8.84					10:233
PE	<u>_</u>	18				10+4.29		12.70	8.68			_		
	L	49				10+4.06		12.56	8.45			REA!	DUG	6.633=9
	<u> </u>	50				10+3.91		12.41	8.30			_		<i></i>
	$\vdash$	51				10+3,78		12.28	8.17					
1	<u> </u>	52				10+3.63		12.13	8.02				٠,	
	<b> </b>	53				10+3.53		12.03	7.92					
	<b></b>	51				10+3-33		11.87	7.76					
-	+>	9.55				1013.2	0	1176	7.65					
Į	<u> </u>	9:57				10+3,0	3	11.53	7.42					
	-	9:59				10+ a.86		11.36	7.25					
	$\vdash$	10:01				10+ 2,61		11.11	700					
	<b></b>	10:03				10+339		10.88	6.77					
	-	10:05			<u>.</u>	10+2.22		10,72						
	$\vdash$	10:07				10+2-05		10.55	6.44					
	-	10:09				16+1.91		10.4	6.30					
	-	10:11				10 H.70		10.7	6.09				_	
1	-	10:13				10+1.51		10.01	5.90					
4	~	10:15				10+1.14		9.94	5.83					
	$\vdash$	10:00				110+1-1-4		9.64	563					
	$\vdash$	10:25				104-94		9.44	5.33					
	-	10:30				10+.73		9.23	5.12					
1	-	10:35				10+.59	- 1	9.09	4.98					
	-	rD: <b>4</b> 0				10+.49		8.94	4.83					
	-	10:45				104.33		8.83	4.72					
	-	10:50				10+.24		8.74	4.63				_	
	-	10:55				10+14		8.64	4.53					
	-	11:00				10+.05		8.55	9.44				_	
~	سا	11:05				LAT 4.94	[	8.44	4,33					

WELL 30-86

#### AQUIFER TEST DATA

TYPE OF AQUIFER TEST\_\_\_ HOW Q MEASURED\_

HOW W. L.'s MEASURED \_\_

RAD./DIST. OF/FROM PUMPING WELL \_\_\_\_

A	WELL 30-86  PUMPING OF OBSERVATION WELL  PUMPING OF RECOVERY DATA  PAGE 2 OF 2					
BEPTH OF PUMP/AIR PUMP ON: date	PIPE					

		ELEVATION OF MEAS. POINT								N OF AQUII				
	TIME t= at t'=0					STATIC WATER LEVEL 5+,61 (Met ACT.)			FER TEST		ROED			
	0	CLOCK		±'		READING	CONVERSIONS	WATER	3 or 8'		READ-	0	ECOI B	COMMENT
		1115				4.8145		8.3/	4.20	<del>                                     </del>	ING		-	
	$\neg$	1125				5+4.70		8.20	4.09					
١	$\neg$	1135				544,55	<i>"</i>	8.05	3.94	<del>                                     </del>				
		1145				5+4.46	"	7.96	3.85					
	$\neg$	1153				6+4.41	<i>"</i>	7.91	380	<del>                                     </del>	1			
1		1205				5+ 1.34	-	7.84	3.73	<del>                                     </del>	1			
ı		1215				5+4.22	"	7.72	3.61	<del>                                     </del>				
Ì		1225				5+4.10		7.60	349					
Ì	7	1255				5+4.07		7.57	346					
İ	Z	1245				5+4.04		7.54	3.43					
7	1	1300				51 3.92		7.+2	3.3/	1				
								<u> </u>		90%				
	2	14:12				5+1.28								
	5	9:15				5+ 0.62								
	3	15:00				5+061								
	6	813				5+0.82								
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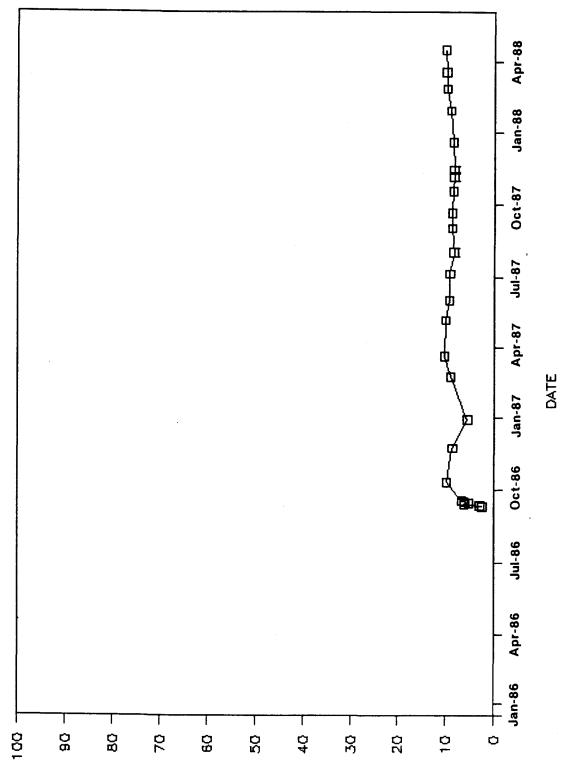
HYDRO-SEARCH RENO-DENVER

CONSULTING HYDROLOGISTS-GEO

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3086	09/12/86	5956.21	5957.62	1.41	14.93	12.33	5945.29
	09/13/86					11.94	5945.68
	09/15/86					8.67	5948.95
	09/16/86					9.67	5947.95
	09/17/86					8.87	5948.75
	09/18/86					8.66	5948.96
	09/19/86					8.14	5949.48
	10/13/86					5.07	5952.55
	11/26/86					6.21	5951.41
	01/01/87					9.33	5948.29
	02/25/87					5.90	5951.72
	03/23/87					4.58	5953.04
	05/08/87					4.79	5952.83
	06/03/87					5.62	5952.00
	07/08/87					5.70	5 <b>95</b> 1.92
	08/04/87					6.50	5951.12
	09/03/87					6.10	5951.52
	09/23/87					6.10	5951.52
	10/21/87					6.40	5951.22
	11/09/87		•			6.50	5951.12
	11/17/87					6.50	5951.12
	12/22/87					6.40	5951.22
	02/01/88					5.90	5951.72
	02/29/88					5.10	5952.52
	03/21/88					5.00	5952.62
	04/18/88					4.90	5952.72

SATURATED THICKNESS IN WELL # 30-86 (SP)



SATURATED THICKNESS (ft.)

#### INDEX OF DATA

Boring No.: 31-86								
Completed as well? Yes								
Data in File								
X Log of Borehole								
X Well Construction Summaries								
Well Development Summaries								
Hydraulic Conductivity Test Data and Results								
Packer Test Data and Results								
X Water Level Data								
X Saturated Thickness Hydrographs								

Project:

Rocky Flats Plant

## LOG OF BORING NO. 31-86

Date Drilled 9/2/86

Boring Mathod Hollar St

Coordinates N38066.2 E 21661.8

Ground Surface Elevation

Boring Method Hollow Stem Auger Ground Surface Elevation 5964.21									
Elev. (feet)	Depth (feet)	Semple Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	င်မိုင်း 20 40	Other Tests		
	0 -		0.00	ARTIFICIAL FILL		7 7 7 7 7 <u>-</u> -			
	-			0-2.0'-Sample. Recovered 2.0/2.0'=100%. 0-0.9': SILTY GRAVEL: grayish brown (5YR 2/2)		- -			
	-			very fine-grained sand, silt and gravel; few roots; poorly sorted; angular; unconsolidated; dry.		-			
	- 5 - -			ARAPAHOE FORMATION		-			
	-			0.9-2.0': SAND: light gray (N 8/0) to dusky brown (5YR 3/2) medium to fine-					
	-			grained; some clayey sand; moderately sorted; firm; apparent bedding from variation in clay fraction; alternating layers of sand		-			
	10-			and clayey sand; dark yellow stain (10YR 6/6) increase in sand and silt percent from 1.5-2.0'; firm; damp.					
	-			2.0-4.0'-Sample. Recovered 1.2/2.0'=60%.					
	-			SAND: light gray (N 8/0) to grayish orange (10YR 4/4); medium-grained sand, some clay and silt; dark yellowish orange (10YR 6/6)			- - - - -		
	15-			mottles; calcareous sand from 3.0-3.5'; firm; damp.			1		
	-			4.0-7.0'-Sample. Recovered 3.0/3.0'=100%. SAND: grayish orange (10YR 7/4); silty and clayey sand at 4.9 and 6.2'; calcareous fracture					
	20			at 6.8'; medium to fine- grained; quartz predominates; soft; damp.	1111	1 1 1 1 1			
Rem	narks	L	ogged by	: T. Murphy		Checked by:	AP.		
Project No. Hydro-Search, Inc. Page 1 of 3									

Project:

Rocky Flats Plant

## LOG OF BORING NO.

31-86

Date Drilled 9/2/86

Boring Method Hollow Stem Auger

Coordinates N 38066.2 E 21661.8 Ground Surface Elevation 5964.21'

Boring Method Hollow Stem Auger Ground Surface Elevation 5464.21'									
Elev. De (feet. (fe	pth Bampa et) Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	Contains 1	Other Tests			
7	0 - 1				-				
	1 1 1		7.0-12.0'-Sample. Recovered 5.0/5.0'=100%. SAND: grayish orange (10YR 7/4); medium to fine- grained; moderately clean;		-				
-	25-		some silt; slight color variation to pale olive (10YR 6/2) with depth; soft; damp.						
	1		12.0-17.0'-Sample. Recovered 4.0/5.0'=80%. 12.0-14.9': SAND: pale olive (10YR 6/2) to grayish orange (10YR 7/4); medium to fine-grained; moderately		-				
_	30-	,	clean; some silt; soft; damp.  14.9-16.5': CLAYSTONE: grayish olive (10Y 9/2); dark yellowish orange		- - -				
			(10YR 6/6) mottles; occasional thin sand layers at 14.8 and 15.8'; slightly calcareous; firm; damp. 16.5-17.0': CLAYSTONE:		-				
-			dark olive gray (5Y 3/2); silty; black wood fragments; firm; damp.		-				
	35-		17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. 17.2-17.7': CLAYSTONE: dark olive gray (5Y 3/2); silty; black wood fragments; firm; damp.		-				
	40-		17.7-20.0': SAND: pale olive (10Y 6/2); yellowish orange (10YR 6/6) mottles; some fine-grained sand; occasional sand lenses 0.2' thick; silty; firm; damp.						
Remark		ogged by:	: T. Murphy		Checked by:	J.J.			
Project			Hydro-Search,	Page 2 of 3					

Project:

Rocky Flats Plant

## LOG OF BORING NO. 31-86

Date Drilled 9/2/86

Boring Mathod Holle

Coordinates N 38066.2 E 21661.8 Ground Surface Flevation

Boring Method Hollow Stem Auger Ground Surface Elevation 5964.21									
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Water Content (%) 20 40	Other Tests		
	40_			20.0-20.9': CLAYSTONE: moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6); dark yellowish orange (10YR 6/6) stains; firm; damp.		-			
	 - - 45_			20.9-22.0': CLAYSTONE: moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6); dark yellowish orange (10YR 6/6) stains; ironstone; firm; damp.					
	-			TOTAL DEPTH: 22.0'		-			
	50					- - - -			
						- - -			
	55 <i></i>					-			
	-					_			
	60								
Rem	arks	' Lo	gged by	: T. Murphy		Checked by:	JUL		
Pro	Project No. 106P06222  Hydro-Search, Inc. Page 3 of 3								

WELL	31-86	

WELL CONSTRUCTION SUMMARY LOCATION or COORDS: \_ ELEVATION: GROUND LEVEL \_\_\_5964.21' N 38066.2 E 21661.8 TOP OF CASING \_\_\_5966.67' 5 DRILLING SUMMARY: CONSTRUCTION TIME LOG: START FINISH TOTAL DEPTH Well: 17.32' Hole: 22.00' TASK BOREHOLE DIAMETER \_\_\_\_ 741 DATE TIME DATE TIME 1986 DRILLING: 1986 DRILLER Boyles Brothers Drilling Co. \_10 7½" auger 9/2 1100 9/2 1255 15865 W. 5th Avenue, Golden, CO Dave Jarvie RIG \_\_\_\_\_ Mobile B-57 GEOPHYS. LOGGING: BIT(S) \_\_T-5 CASING: T. Murphy 2" stainless 9/2 1445 9/2 1450 -15 DRILLING FLUID \_\_\_\_ None SURFACE CASING 5" x 5' steel w/ locking FILTER PLACEMENT 1503 9/2 1510 9/2 1515 9/2 1530 PERSONNEL CEMENTING: WELL DESIGN: 9/12 LOCATION 1240 9/12 CEVELOPMENT: 1240 BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG OTHER: 9/2 <u>Bentonite</u> 9/2 CASING STRING(S): C=CASING S=SCREEN 1510 1515 0.00' 2.46' C1 9/2 1430 9/2 1445 2.46' - 17.32' S1 25 WELL DEVELOPMENT See Well Development Summary Sheet. **-**30 - Rocky Flats Plant CASING: C1 2" I.D., Sch. 5 Type 316 stainless steel threaded and flush SCREEN: SI 2" I.D., Sch. 5 Type 316 stain-**-**35 less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen PROJECT 106P06222 0.25' welded bottom cap. No water encountered during drilling. CENTRALIZERS Type 304 stainless steel <u>4.00' - 5.00';</u> 9.00' - 10.80' \_40 Top of stainless steel casing: 2.46' FILTER MATERIAL 32-42 silica sand 2.40' - 18.30' CEMENT Portland Type I 0.00' - 1.80' -45 OTHER \_\_\_3/8" bentonite pellets 1.80' - 2.40' 18.30' - 22.00' -50

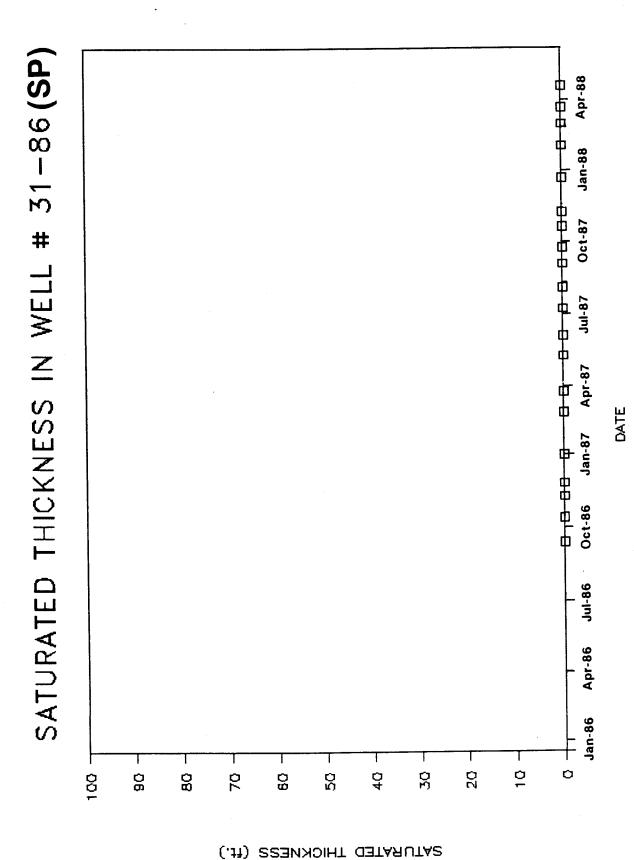
HYDRO-SEARCH RENO-DENVER

CONSULTING HYDROLOGISTS-GEOLOGISTS

#### ROCKY FLATS SOLAR PONDS

#### WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3186	09/12/86	5964.21	5966.67	2.46	17.32	-1.00	DRY
	10/13/86					-1.00	DRY
	11/09/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/23/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					-1.00	DRY
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY,
	12/22/87					-1.00	DRY
	02/01/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY



#### INDEX OF DATA

Boring No.: 32-86							
Completed as well? Yes							
Data in File							
X Log of Borehole							
X Well Construction Summaries							
Well Development Summaries							
X Hydraulic Conductivity Test Data and Results							
X Packer Test Data and Results							
X Water Level Data							
Saturated Thickness Hydrographs							

Rocky Flats Plant

### LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86-9/25/86

Ground Surface Flevetion 52640.7

Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5964.46'							
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	-0		0	ARTIFICIAL FILL			
	-			0-2.0'-Sample. Recovered 2.0/2.0'=100%.			
	-			0-0.8': TOP SOIL: dark yellowish brown (10YR 4/2);			
	_			unconsolidated; dry.			
				ARAPAHOE FORMATION		_	
	- 5 - <u>-</u>			0.8-2.0': SANDSTONE: light gray (N 7); medium to fine-grained; mostly fine-		_	
	-			grained; mostly line- grained sand and silt; slightly calcareous; massive; no apparent		-	
	-			massive; no apparent bedding; well sorted; firm; dry.		<u> </u>	
	-		1	2.0-4.0'-Sample. Recovered 2.0/2.0'=100%.		-	
	-10-		4	SANDSTONE: light gray (N 7); dark yellowish orange (10YR 6/6) stains;		-	
	_			increase in silt content; soft; well sorted; dry.		-	
	-		1	4.0-7.0'-Sample. Recovered 3.0/3.0'=100%.		<u>-</u>	
	_	1/	1	SANDSTONE: light gray (N 7) with dark yellowish orange (10YR 6/6) mottling; increased clay and silt at		-	
-		1//	1	4.8' to 6.3'; bedding 0.05' thick; apparent bedding from variations in			
	15 —	1/	1	staining; leaf imprints; very slightly calcareous along fractures; soft;		_	
	-	1/	1	damp.  7.0-12.0'-Sample.		_	
	-	$Y_{/}$		Recovered 5.0/5.0'=100%. SANDSTONE: medium light gray (N 6) to medium dark		_	
	-	1/		gray (N 4); fine to very fine-grained; silty with some clay; dark yellowish		-	
		<b>/</b> /		orange (10YR 6/6)stains; clayey sand layers alternate with sand layers 0.5-0.8' thick; soft; damp.		-   , , , ,	
Rem	arks	Los	gged by	T. Murphy & J. Bergman		Checked by:	100
Pro	ject No 1061			Hydro-Search,	Inc.	Page 1 of 7	

Rocky Flats Plant

#### LOG OF BORING NO.

32-86

Date Drilled 9/3/86, 9/22/86-9/25/86

Coordinates N 38065.7 E 21640.7

Ground Surface Elevation 5067.72

Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5964.46'							
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
Elev. (feet)	20 - 25 35	Sample	Graphic	Material Description  12.0-17.0'-Sample. Recovered 5.0/5.0'=100%. 12.0-16.5': SANDSTONE: medium light gray (N 6) to medium dark gray (N 4); fine to very fine-grained; silty with some clay; dark yellowish orange (10YR 6/6) stains; soft; damp. 16.5-17.0': CLAYSTONE: medium gray (N 5) to dark gray (N 2) and pale olive (10YR 6/2); black wood fragments; amount of clay and thickness of beds increase with depth; firm; damp.  17.0-22.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: grayish olive (10Y 4/2) to medium gray (N 5); dark yellowish orange (10YR 6/6) mottles; calcareous thin sand lenses at 18.0 and 18.5'; lenses are 0.01-0.02' thick; firm; damp.  22.0-27.0'-Sample. Recovered 5.0/5.0'=100%. CLAYSTONE: grayish olive (10Y 4/2) to medium gray (N 5); dark yellowish orange (10YR 6/6) mottles; firm; damp.  25.0-31.0'-Sample. Recovered 0.0/6.0'=0%.  31.0-36.0'-Sample. Recovered 2.8/5.0'=56%. RQD=1.7/2.8'=12%. CLAYSTONE: pale yellowish brown (10YR 6/2) clay and silty clay; abundant moderate yellowish brown (10YR 5/4) mottles; very well sorted; few organics; consolidated;	(Blows/Inch)		
Rema	40 40	La	ogged by	damp.  36.0-41.5'-Sample. Recovered 0.0/5.5'=0%.  T. Murphy & J. Bergman		Checked by	
Project No.  Hydro-Search, Inc.  Page 2 of 7							

Rocky Flats Plant

### LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

Coordinates N 38065.7 E 21640.7 Ground Surface Elevation 3964.46

Bori	ng Meti	hod	Hollow	Stem Auger/NC Core Ground Sur	face Elevation	on 5964.46'	
Elev. (feet)	Depth (feet)	Semple Type	Graphic Lóg	Material Description	Penetration Resistance (Blows/Inch) 20 40	Weter Content 20 40	Other Tests
	40 - 40 - 45			41.5-47.0'-Sample. Recovered 2.0/5.5'=36\cdot\(^17\). RQD=0.3/2.0'=17\cdot\(^17\). CLAYSTONE: olive gray (5Y 3/2); abundant dark yellowish orange (10YR 6/6) limonite stains predominantly along vertical fractures; consolidated; very well sorted; moist.  47.0-52.0'-Sample. Recovered 3.7/5.0'=74\cdot\(^17\). RQD=2.0/3.7'=54\cdot\(^17\). CLAYSTONE: light olive gray (5Y 5/2); abundant dark yellowish orange (10YR 6/6) and dusky red (5R 3/2) iron staining along fractures; some organics; very well sorted; consolidated; moist.  52.0-57.0'-Sample. Recovered 4.0/5.0'=88\cdot\(^17\). RQD=3.5/4.0'=88\cdot\(^17\). CLAYSTONE: olive gray (5Y 3/2); abundant dark yellowish orange (10YR 6/6) stains; few dusky red (5R 3/2) stains; few organics; very well sorted; consolidated; slightly damp fragments; few wood fragments; few wood fragments; few wood fragments; few wood fragments; few wood fragments; some moderate yellowish brown siltstone; very well sorted; consolidated; firm; damp.		20 40	
Rem	narks	Lo	ogged by	: T. Murphy & J. Bergman		Checked by:	THE

Project No.

106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

### LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

Coordinates N 38065.7 E 21640.7

Boring Method Hollow Stem Auger/NC Core

**Ground Surface Elevation** 

Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5964.46							
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	တိုင်္ကိုင်္ဂေ 20 40	Other Tests
	60			62.0-67.0'-Sample. Recovered 5.0/5.0'=100%. RQD=4.0/5.0'=80%. CLAYSTONE: olive gray (5Y		-	
	-			3/2); few yellowish orange mottles (10YR 5/4); no organics; very well sorted; consolidated; damp.		-	
	65			67.0-72.0'-Sample.		- - -	
	 			Recovered 0.6/5.0'=12%. RQD=0.0/0.6'=0%. CLAYSTONE: olive gray (5Y 3/2); few moderate yellowish brown (10YR 5/4) mottles; well sorted;	·	- - -	
	70			consolidated; no organics; homogenous; damp. -		- - -	
,	- - -			72.0-77.0'-Sample. Recovered 2.5/5.0'=50%. RQD=0.6/2.5'=24%. CLAYSTONE: olive gray (5Y 3/2); very well sorted;		- - -	
-	-   -   -			consolidated; homogenous; several black organic fragments; slightly damp.		- - -	
	75— - - -			78.0-83.0'-Sample.		- - -	
	- - -			Recovered 3.0/5.0'=60%.  RQD=2.2/3.0'=73%.  CLAYSTONE: olive gray (5Y-3/2); moderate yellowish brown (10YR 5/4) siltstone nodules; well sorted; consolidated; homogenous;		- -	
Rem	80 arks	Lo	gged by	no organics; moist.  T. Murphy & J. Bergman		Checked by:	
Proj	ject No 1061	PO6222		Hydro-Search,	Inc.	Page 4 of 7	

Rocky Flats Plant

### LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

Boring Method Hallow Stom Auger/NC Co

Coordinates N 38065.7 E 21640.7 Ground Surface Elevation 5964.461

83.0-87.0'-Sample. Racovered 3.0/4.0'=75t. RQDP-1.4/3.0'-47t. CLAYSTOKE: olive gray (5Y 3/2); common moderate yellowish brown (10YR 5/4) mottles and siltstome nodules; well sorted; consolidated; homogenous; acist.  87.0-92.0'-Sample. Recovered 3.8/5.0'=76t. RQDP-0.0/3.8'-0t. CLAYSTOKE: olive gray (5Y 3/2); interbedded gray (N 7) sandy and silty clay; very fine-grained; well sorted; consolidated; nicely laminated 0.7'thick; moist.  92.0-97.0'-Sample. Recovered. 2/5.0'-64t. RQDP-2.9/3.2'-91t. SILTY SANDSTOKE: light gray (N 7) interbedded with olive gray (5Y 1/2) silty clay; very fine-grained; very vell sorted; rounded; consolidated; rounded; consolidated; dry.  95.0-103.0'-Sample. Recovered 3.6/6.0'=60t. RQDP-1.3/3.6-16t. CLAYSTOKE: olive gray (5Y 3/2) clay and silty clay; very fine-grained; very vell sorted; rounded; consolidated; dry.	Elev. Depth Sen feet (feet) Ty	ple Graphic pe Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
nicely laminated 0.7'thick; moist.  92.0-97.0'-Sample. Recovered. 2/5.0'=64*. RQD=2.9/3.2'=91*. SILTY SANDSTONE: light gray (N 7) interbedded with olive gray (5Y 3/2) silty clay; very fine-grained; very well sorted; rounded; consolidated; dry.  97.0-103.0'-Sample. Recovered 3.6/6.0'=60*. RQD=1.3/3.6=36*. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; very fine-grained; little sand; ?ew moderate yellowish brown mottles (10VR 5/4); very well sorted; consolidated; slightly damp.			Recovered 3.0/4.0'=75%. RQD=1.4/3.0'=47%. CLAYSTONE: olive gray (5Y 3/2); common moderate yellowish brown (10YR 5/4) mottles and siltstone nodules; well sorted; consolidated; homogenous; moist.  87.0-92.0'-Sample. Recovered 3.8/5.0'=76%. RQD=0.0/3.8'=0%. CLAYSTONE: olive gray (5Y 3/2); interbedded gray (N 7) sandy and silty clay; very fine-grained; well			
97.0-103.0'-Sample. Recovered 3.6/6.0'=60%. RQD=1.3/3.6=36%. CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; very fine-grained; little sand; few moderate yellowish brown mottles (10YR 5/4); very well sorted; consolidated; slightly damp.	90-		nicely laminated 0.7'thick; moist.  92.0-97.0'-Sample. Recovered. 2/5.0'=64%. RQD=2.9/3.2'=91%. SILTY SANDSTONE: light gray (N 7) interbedded with olive gray (5Y 3/2) silty clay; very fine-grained; very well sorted; rounded;			
			Recovered 3.6/6.0'=60%.  RQD=1.3/3.6=36%.  CLAYSTONE: olive gray (5Y 3/2) clay and silty clay; very fine-grained; little sand; few moderate yellowish brown mottles (10YR 5/4); very well sorted; consolidated;		      	

Rocky Flats Plant

#### LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

Boring Method Hollow Stem Auger/NC Core

Coordinates N 33065.7 E 21640.7

Ground Surface Elevation 5964.461

Project No. 106P06222

Hydro-Search, Inc.

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Rocky Flats Plant

### LOG OF BORING NO. 32-86

Date Drilled 9/3/86, 9/22/86 - 9/25/86

Coordinates N 38065.7

E 21640.7

Boring Method Hollow Stem Auger/NC Core

Ground Surface Elevation 5064 461

	ethod	HOTTOW S	Stem Auger/NC Core Ground Sui	Paration		
Elev. Dep (feet) (fee	th Sample t) Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	င်ဝိဂျီင်ခိုင်ဂ 20 40	Other
—12 ——13			122.0-127.0'-Sample. Recovered 4.2/5.0'=84%. RQD=4.0/4.2'=95%. SILTY SAND: light gray (N 7/0); fine and very fine-grained sand and silty sand; thinly laminated with alternating layers of clive gray (5Y 3/2) clay and light gray (N 7) sand; well sorted; consolidated; rounded; dry.  127.0-132.0'-Sample. Recovered 2.0/5.0'=40%. RQD=0.8/2.0'=40%. CLAYSTONE: clive gray (5Y 3/2) clay and silty clay; one moderate yellowish brown (10YR 5/4) siltstone layer at 131.0' 0.02'wide; very well sorted; consolidated; rounded; dry.  132.0-135.0'-Sample. Recovered 1.5/3.0'=50%. RQD=0.0/3.0'=0%. CLAYSTONE: clive gray (5Y 3/2); no mottles; well sorted; consolidated; homogenous; dry.			
13.			TOTAL DEPTH: 135.0'			
Remarks		gged by:	T. Murphy & J. Bergman		Checked by:	ALL
Project !	<b>lo.</b> 6P06222		Hydro-Search,	Inc	Page 7 of 7	· \ \-

WELL	32-86	

WELL CONSTRUCTION SUMMARY LOCATION or COORDS: E 21640.7 5964.46' ELEVATION: GROUND LEVEL -5966.96' TOP OF CASING \_ DRILLING SUMMARY: CONSTRUCTION TIME LOG: FINISH START TOTAL DEPTH Well: 125.50' Hole: 135.00' TASK BOREHOLE DIAMETER 0.00' - 27.00': 74" DATE TIME DATE TIME 27.00' - 135.00': 5 5/8" 1986 1986 DRILLING: 7½" auger 9/3 1030 9/3 1210 DRILLER Boyles Brothers Drilling Co. Bergman 15865 W. 5th Avenue, Golden, CO 9/23 1600 9/25 1515 NC core 1200 (Dave Jarvie, Robert Roach) 9/27 1000 9/27 Reaming RIG 0.00'-27.00' Mobile B-57; 27.00'-135.00 GEOPHYS. LOGGING: BIT(S) 0.00' - 27.00': T-5 Murphy/J. CASING: 27.00' - 135.00': Carbide bit 9/3 9/3 1505 5" steel 1445 DRILLING FLUID 0.00' - 27.00': None 0950 2" stainless 9/29 0920 9/29 27.00' - 135.00': air/water mist SURFACE CASING 5" x 30.50' steel w/ lock-9/29 9/29 1055 1415 FILTER PLACEMENT 9/29 1530 9/29 1630 CEMENTING: PERSONNEL WELL DESIGN: 10/14 1430 11/7 0945 LEVELCPMENT: BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG \_ OTHER: 9/29 1415 9/29 1445 Bentonite CASING STRING(S): C=CASING S=SCREEN 9/27 1305 9/27 1310 0.00' 27.00' C1 9/27 0940 0.00'- 114.90' C2 9/25 1330 Packer testing Cementing 5" steel 114.90'- 125.50' S1 9/3 1530 9/3 1506 WELL DEVELOPMENT See Well Development Summary Sheet. 120 5" I.D. steel surface casing CASING: CI c2 2" I.D. Sch. 5 type 316 stain-Rocky Flats Plant less steel, threaded and flush jointed. SCREEN: SI 2" I.D. Sch. 5 type 316 stain-[140 less steel, threaded and flush COMMENTS: jointed, 0.010" wire wrap screen, 0.25' welded bottom cap. No water encountered during drilling. CENTRALIZERS \_\_\_None Top of stainless steel casing: 2.50' **-** 160 PROJECT FILTER MATERIAL 32-42 silica sand 112.00' - 114.00' CEMENT Portland Type I 0.00' - 112.00'- 180 OTHER 3/8" bentonite pellets 112.00' - 114.00' 126.001 - 135.001

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CLIEN 1/SUBJECT		<del></del>	W.O. NO		
TASK DESCRIPTION			TAS	SK NO	
PREPARED BY	DEPT	DATE	AF	PROVED BY	
MATH CHECK BY	DEPT	DATE			
REPARED BY	DEPT	DEPT DATE		DATE	
	•	12-86	C.		
Hydraulie	Conductivity	(cm/sec)=	9 × 10-8		
Flowrate	(4pm) = .	5,8/ x /0 -2	pm		

Screenes Interval (ft below G.L.) = 114.90'- 125.50'

114.90 - 115,20' claystone

115.2 - 125.50' silty sandstone

Method of Analysis: Residual - Grawdown Plot

(Driscoil, 1986 - 12 256.)

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CLIENT/SUBJECT			W.O. NO						
TASK DESCRIPTION			TASK NO						
PREPARED BY	DEPT	DATE	APPROVED BY						
MATH CHECK BY	DEPT	DATE							
METHOD REV. BY	DEPT	DATE	DEPT DATE						

WELL 32-86

$$T (qpd/ft) = \frac{264Q}{\Delta s'} = \frac{264(5.81 \times 10^{-2})}{778} = 1.97 \times 10^{-2}$$

where Q (gpm) = 3.75 gal/64.5 min = 5.81 x10-2 gpm

AS'= ft. change in residual drawdown / log cycle

= 178 ft/logo de (see attached plot)

$$K(gpd/ft^2) = T/b = \frac{1.97 \times 10^{-2}}{10.6} = 1.86 \times 10^{-3}$$

where b (ft) = 10,6 ft

K (cm/sec) = 1.86×153 gpd/ft2 x 4.72×10-5 = 7×10-8

This method is valid where u < 0.01

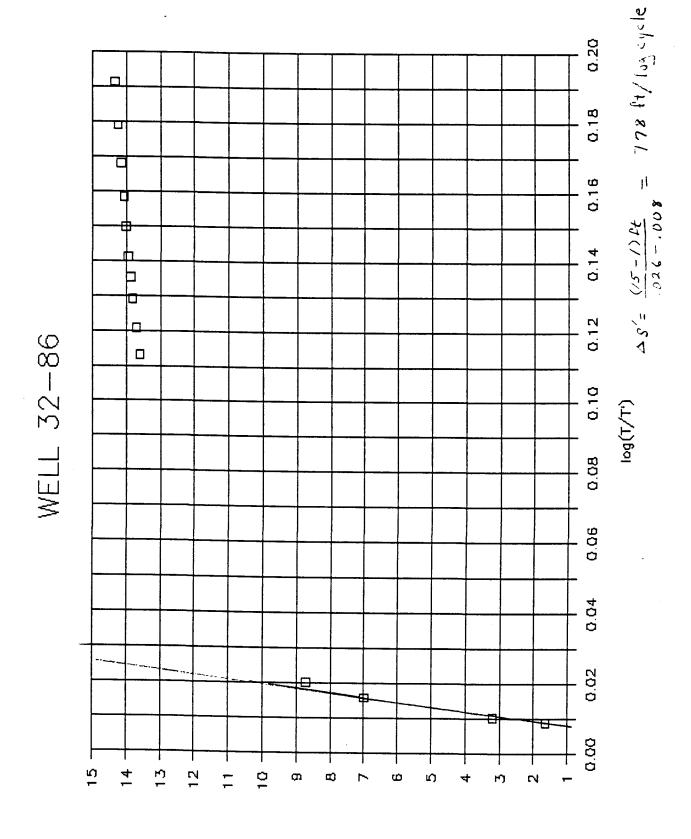
solving for t for  $\alpha \leq 0.01$ .

$$\pm (min) = \frac{rz}{4 + u} = \frac{(0.234)^{2} (10^{-3})}{(4) (1.97 \times 10^{-2}) (.01)} \times \frac{1440 min}{day} \times \frac{7.482 \text{ cal}}{f+3}$$

$$= 749 \text{ min}.$$

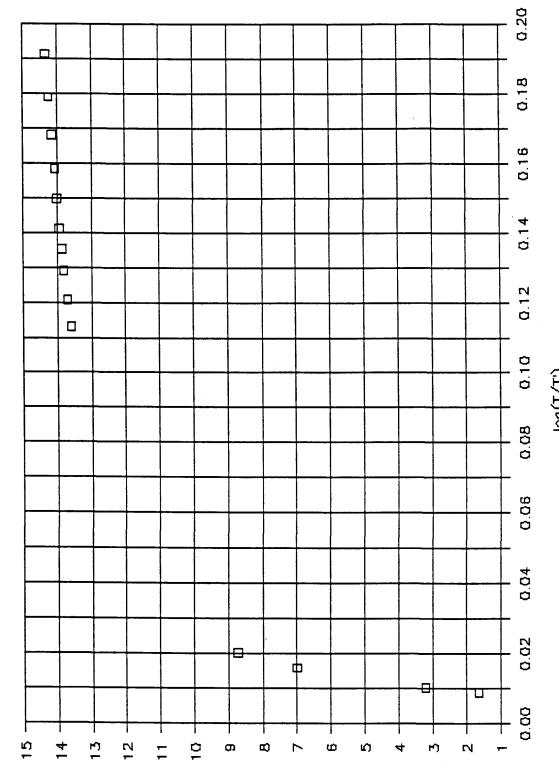
where 
$$r(ft) = \left(\frac{5}{24}\right) ft = 0.234 ft$$

 $S = 10^{-3}$  assumed S for confined aguifer  $\Delta S'$  was eased on pts based on  $t \ge 1425$  min.

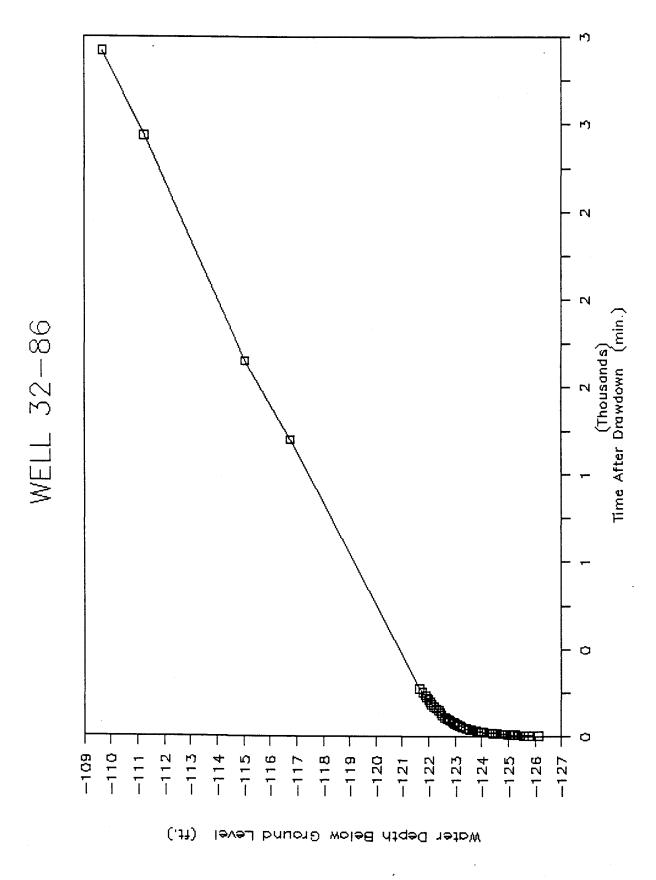


Residual Drawdown (ft.)

WELL 32-86



Residual Drawdown (ft.)



)		•	•		
	T	Т'	WELL 32-8 Water	s'	log(T/T')
	Time	T Prime		Rsd Drwdn	
	(min.)	(min.)	(ft.)	(ft.)	
	66.00	1.50	126.13	18.08	1.64
	67.00	2.50	125.75	17.70	1.43
	67.50	3.00	125.60	17.55	1.35
	68.00	3.50	125.58	17.53	1.29
	68.50	4.00	125.56	17.51	1.23
	69.00	4.50	125.46	17.41	1.19
	69.50	5.00	125.36	17.31	1.14
	70.00	5.50	125.35	17.30	1.10
	70.50	6.00	125.25	17.20	1.07
	71.00 72.00	6.50 7.50	125.20 125.08	17.15	1.04 0.98
	73.00	8.50	123.08	17.03 16.91	0.93
	74.00	9.50	124.84	16.79	0.89
	75.00	10.50	124.77	16.72	0.85
	76.00	11.50	124.67	16.62	0.82
	77.00	12.50	124.57	16.52	0.79
	78.00	13.50	124.50	16.45	0.76
	79.00	14.50	124.41	16.36	0.74
	80.00	15.50	124.31	16.26	0.71
	81.00	16.50	124.28		0.69
	83.00	18.50	124.08		0.65
,	85.00 87.00	20.50 22.50	123.96		0.62
	89.00	24.50	123.86 123.79		0.59 0.56
	91.00	26.50	123.79		0.54
	93.00	28.50	123.61		0.51
	95.00	30.50	123.53		0.49
	97.00	32.50	123.46		0.47
	99.00	34.50	123.41		0.46
	101.00	36.50	123.37	15.32	0.44
	106.00	41.50	123.24		0.41
	111.00	46.50	123.18		0.38
	116.00	51.50			0.35
	121.00 126.00	56.50 61.50			0.33
	131.00	66.50			0.31 0.29
	136.00	71.50			0.29
	141.00	76.50			0.27
	146.00	81.50			0.25
	151.00	86.50			0.24
	161.00	96.50			0.22
	171.00	106.50			0.21

		WELL 32-8	36	
T	T'	Water	s'	log(T/T')
Time	T Prime	Level	Rsd Drwdn	
(min.)	(min.)	(ft.)	(ft.)	
181.00	116.50	122.39	14.34	0.19
191.00	126.50	122.29	14.24	0.18
201.00	136.50	122.21	14.16	0.17
211.00	146.50	122.12	14.07	0.16
221.00	156.50	122.06	14.01	0.15
232.50	168.00	121.98	13.93	0.14
241.00	176.50	121.92	13.87	0.14
251.00	186.50	121.86	13.81	0.13
266.00	201.50	121.75	13.70	0.12
281.00	216.50	121.65	13.60	0.11
1425.00	1360.50	116.77	8.72	0.02
1789.00	1724.50	115.06	7.01	0.02
2814.00	2749.50	111.26	3.21	0.01
3199.00	3134.50	109.70	1.65	0.01

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#### AQUIFER TEST DATA

3.2441 11:4530

PUMPING or OBSERVATION WELL PUMPING OF RECOVERY DATA

TYPE OF AQUIFER TEST SAL DOWN RECOGO TEST 4 Gre BUCKET HOW Q MEASURED\_\_\_ CLIMPIC HOW W. L.'s MEASURED \_ RAD./DIST. OF/FROM PUMPING WELL \_\_\_ MEAS. POINT FOR W.L.'s -

PAGE \_\_\_\_ OF \_\_\_\_ DEPTH OF PUMP/AIRPIPE time 10:41:00 PUMP ON: date 11-10-86 time 11:45:30 PUMP OFF: date 11-10-90

DURATION OF AQUIFER TEST

ELEVATION OF MEAS. POINT. WATER LEVEL DATA RECORDED BY TIME DISCHARGE STATIC WATER LEVEL 105 + 3,05 at t'=0COMMENTS t = . 108.05 110.10 READING CONVERSIONS READ-CLOCK WATER Q T.D. 122.03' 5 or 5' ING LEVEL 10:41 3 APTED 12613 18.08 0.0 11:45 -250 25+363 cw Par 1 17.70 11:48 1.0 7549.29 -2.50 125.75 Finished Cain 25+3,10 -2.50 125.60 17.55 1.5 11:42/ 11:45 130 17.53 2.0 125.3.08 125.58 11.49 // 17.51 2.5 125+3.00 125.56 11:41/2 Fec. 3.75 2211 125.46 17.41 11 3.0 11:50 25+2.96 17.31 11:575 3.5 751200 125.36 125+2.21 4.0 125.35 17.30 11:01 4.5 25-1795 125.25 17.20 40% = 110. 125.20 17.15 11.52 5.0 25+2.70 RECOUNT 17.53 11:55 6.0 125.55 124.96 7.0 16.51 nie 124.84 2 125475 16.79 9 124.77 16.72 124.67 75+2. 16.62 10 16.52 11 124.51 25+117 111 1 124.50 12 16.15 125 + 2.1 13 124.41 16.36 12: 125+1.7 124.31 16.26 14 17011.8 12.01 15 16.23 124.29 200 2 15.03 -11.4 124.38 D C+ 1 17 c .. 11111 15.91 19 123.% 15.31 22.23 21 25+1.36 23 123.70 15.74 33+12 15.63 122 -25 2541.18 25+1 K.56 4 27 12351 123.53 15.78 74) 12:15 125+ 1.03 2113 31 125+.96 123,00 15.41 33 257.91 15.36 20 123,41 15.32 35 25+.87 123.37 25T.74 12:,27 15.15 40 123,24 15.13 45 125+.68 123.15 125+,58 15.03 - 202 50 123.08 125+49 122.99 14.94 55 60 1251.44 122.94 12.00 12:47 122.36 14.31 65 14.74 254.29 122.79 70 122.75 14.70 13:02 75 125+.25

PROJECT

PERSONNEL OCATION

> 5.5 HYDRO-SEARCH

85

13:07

13:12

13:22

RENO . DENVER

125+18

125+. 12

125+00

122.33

122.62

14.63

14.57

14.45

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TYPE OF AQUIFER TEST BOTHOW Q MEASURED A Q Q Q Q Q MEASURED A Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q	DEPTH OF PU PUMP ON: do PUMP OFF: do	WELL 32-86  PUMPING OF OBSERVATION WELL  PUMPING OF RECOVERY DATA  PAGE 2 OF 2  MP/AIRPIPE  ITE 110-86 time  AQUIFER TEST
IJME	WATER LEVEL DATA	DISCHARGE

1		t=	TIA		· = o	WATER LEVEL DATA					DISCHARGE		RECORDED BY	
10	0	CLOCK		- 31 1	1		CONVERSIONS		s or s'	108.05	READ-	. 0	ECOI B)	COMMENTS
13	片	1332			<del> </del>			122.45	14.40	<del>                                     </del>	ING			
		1342		<del>                                     </del>	<del> </del>	1014.7	-2.50	122.39	14.34	<del> </del>	1	<del> </del>	_	
	-		125		<del> </del>	130489		122.29	14.24	<del>                                     </del>	<del> </del>			
	-		135		<del> </del>	12043			1		<del> </del>	<del>                                     </del>		<del> </del>
	$\vdash$	1412		<b></b>	<del>                                     </del>	120+4.71		122.21	14.16	<del> </del>	╁	-		
19	<u> </u>	1412		<del></del>	<del> </del>	120 14.6		122.12	14.07		<del> </del>			
1212	<del> -</del>		50/66	50	<del> </del>	120+4.56		122.06 121.98	13.93					
11.6		1442		70	<u> </u>	2014,49		121.92	13.87	_	+			
33	$\vdash$	1452				120+4.42		121,86	13.81		<del>                                     </del>	<b></b>		
	7		201.5		<del>                                     </del>	120+4.3V		121.75	13.70	<del>                                     </del>	<del>                                     </del>			
	H	15 22					1	121.65	13.60		+			
LOCATION PERSONNEL	_	1522			<del>                                     </del>	120+4-1		161,60	17,60	<del> </del>	+			
LOCATION PERSONNE		1026				115+4.2	<u> </u>	116.77	8.72	-				
OC/	2	1630				115+2.5		115.06	7.01					
۵ ب	3	09:35			<u> </u>	110+3.76		115.06	1.01	<del>                                     </del>	<del>                                     </del>			
	_	16:00				11073.76				90%				
	4	13:4				105+2.49				2010				
, ,	5	14:03				100+2.68				<del> </del>			,	
	8	9:10				90+1.67					<del>                                     </del>			
	8	15:47				90+0.70				_				
	9	8:46				85+3.44	<del></del>	<del></del>		<del>                                     </del>				
	9					0173.77				_	<u> </u>			
										<u> </u>	<u> </u>	<del>                                     </del>		
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ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 45.20 - 55.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 63.88

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00106954 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 50.20 + 6.20 + 3.50 \* 2.31 = 64.49

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000110 FT/MIN

K = .00000056 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00180062 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 50.20 + 6.20 + 8.00 \* 2.31 = 74.88

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000159 FT/MIN

K = .00000081 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00027077 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 50.20 + 6.20 + 3.00 \* 2.31 = 63.33

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000028 FT/MIN

K = .00000014 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 55.20 - 65.20 MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = ----- LN(--)$$
 $2(PI)(L)(H)$ 
 $R$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00062277 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 60.20 + 6.20 + 3.50 \* 2.31 = 74.48

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000055 FT/MIN

K = .00000028 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00016246 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 60.20 + 6.20 + 10.50 \* 2.31 = 90.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

2ND P1/3 TEST

TEST ABORTED

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 65.20 - 75.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 63.88

K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00104246 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000090 FT/MIN

K = .00000046 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00188185 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 12.80 \* 2.31 = 99.65

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000125 FT/MIN

K = .00000064 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00041969 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 2.00 \* 2.31 = 74.70

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000037 FT/MIN

K = .00000019 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 75.20 - 85.20
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.88

K = ----- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00018954 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000016 FT/MIN K = .00000008 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00115077 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 63.88 + 6.20 + 15.50 \* 2.31 = 105.89

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000072 FT/MIN K = .00000037 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 2.50 \* 2.31 = 75.86

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN
K = .00000006 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 85.20 - 95.20 MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} LN(--)$$

1ST P1/3 TEST

Q = INJECTION RATE = .00035200 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000030 FT/MIN

K = .00000015 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00024369 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 17.50 \* 2.31 = 110.50

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000015 FT/MIN

K = .00000007 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 2.00 \* 2.31 = 74.70

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

 $K = .00000006 \, \text{CM/SEC}$ 

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 95.20 - 105.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 63.88

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST

Q = INJECTION RATE = .00085293 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000073 FT/MIN

K = .00000037 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00140800 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 20.00 \* 2.31 = 116.28

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000080 FT/MIN

K = .00000041 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014892 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000013 FT/MIN

K = .00000007 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 95.20 - 105.92

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 63.88

K = ---- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00085293 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.72 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000070 FT/MIN

K = .00000035 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00140800 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.72 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 20.00 \* 2.31 = 116.28

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN

K = .00000039 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00014892 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.72 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 105.20 - 115.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 63.8

DEPTH TO WATER (FEET BELOW G.S.): 63.88

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00013539 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00163816 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 22.00 \* 2.31 = 120.90

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000090 FT/MIN

K = .00000046 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00029785 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000026 FT/MIN

K = .00000013 CM/SEC

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 9/26/86 BY: J. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 116.08 - 126.08

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.):

K = ----- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

Q = INJECTION RATE = .00086646 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000074 FT/MIN

K = .00000038 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00174647 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 24.00 \* 2.31 = 125.52

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000092 FT/MIN

K = .00000047 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00050092 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 10.00 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 63.88 + 6.20 + 3.00 \* 2.31 = 77.01

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000043 FT/MIN

K = .00000022 CM/SEC

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3286	09/22/86	5964.46	5966.96	2.50	125.50	54.00	5912.96
	09/22/86					54.00	5912.96
	10/13/86					66.34	5900.62
	10/17/86					103.5	5863.46
	10/21/86					101.5	5865.44
	10/28/86					89.67	5877.29
	11/04/86					89.20	5877.76
	11/05/86					112.6	5854.36
	11/06/86					119.8	5847.19
	11/07/86					115.9	5851.07
	11/26/86					72.32	5894.64
	01/01/87					54.92	5912.04
	02/25/87					53.77	5913.19
	03/23/87					53.33	5913.63
	03/24/87					110.0	5856.96
	05/08/87					64.33	5902.63
	06/03/87					55.74	5911.22
	07/08/87					82.10	5884.86
	08/04/87					57.00	5909.96
	09/03/87					54.40	5912.56
	10/21/87					58.30	5908.66
	11/09/87					54.40	5912.56
	11/17/87					54.40	5912.56
	12/22/87					54.10	5912.86
	02/01/88					54.80	5912.16
	02/29/88					54.00	5912.96
	03/21/88					54.70	5912.26
	04/18/88					57.20	5909.76

SATURATED THICKNESS IN WELL # 32-86 (SP) Apr-88 Jan-88 Oct-87 Jul-87 Apr-87 DATE Jan-87 Oct-86 B Jul-86 Apr-86 Jan-86 - D6 80 2 100 60 **2**0 40 30 20 0 O

SATURATED THICKNESS (ft.)

#### INDEX OF DATA

Boring No.: 33-86								
Completed as well? Yes								
Data in File ·								
X Log of Borehole								
X Well Construction Summaries								
Well Development Summaries								
Hydraulic Conductivity Test Data and Results								
Packer Test Data and Results								
X Water Level Data								
Saturated Thickness Hydrographs								

Rocky Flats Plant

## LOG OF BORING NO. 33-86

Date Drilled 9/10/86

Roring Method Hollaw Stem Au

Coordinates N 36960.9 E 21896.5

Ground Surface Flevetion

Bori	ng Met	hod	Hollow	Stem Auger Ground Su	rface Elevatio	5949.28'	
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Collegent 20 40	Other Tests
	0		2°°°				
				ROCKY FLATS ALLUVIUM	l i	_	
			3,0°				
					l i		
			$\mathcal{S}_{\mathcal{S}_{\mathcal{S}_{\mathcal{S}_{\mathcal{S}_{\mathcal{S}}}}}}$		l i		
			$\bigcirc$ .8			_	
			$\mathcal{O}_{\mathcal{O}}$	0-4.8'-Sample.	1		
			$\tilde{S}\tilde{S}\tilde{S}\tilde{S}\tilde{S}$	Recovered 3.1/4.8'= 65%.			
				GRAVEL: light olive gray		-1-	
	5_			(5Y 5/2)to olive gray (5Y 3/2); clayey silt and sand		_	
			80°°	matrix; quartzite pebbles;		_	1
			000	poorly sorted; subangular; crumbles; dry.	]	-	1
		<b>I</b> /	.00.0		į į	-	I
			2000			_	1
				4.8-6.8'-Sample.		_	j
	-			Recovered 2.0/2.0'=100%. GRAVEL: light olive gray			j
				(5Y 5/2); clayey sand		_	İ
	_			matrix; quartzite cobbles and gravel clasts; angular		_	
	-			to subangular; moderate	1	_	1
		1/		sorting; loose; dry.	į l		j
	10-	1				_	
·	-					_	
	_	1		ARAPAHOE FORMATION		_	
	-	1/					
	_	T		6.8-11.8'-Sample.		_	
	-	1		Recovered 5.0/5.0'=100%. 6.8-7.0': GRAVEL:		,	1
	_	T		light olive gray (5Y 5/2);			
	_	1_		clayey sand matrix;	ł i		
	-			quartzite cobbles and gravel clasts; angular to	]		]
	, -	1		subangular; moderate		_	
	15-	1		sorting; loose; dry.			
	1	1/					
	~	1		7.0-11.8': CLAYSTONE:			1
	]	1		grayish yellow green (5GY 7/2) to grayish		_	]
	-	1	1	olive green (5GY 3/2) with		_	]
	[ ]	1		olive gray (5Y 3/2) to		_	]
		1		greenish gray (5GY 6/1) and dark yellowish orange			j
		1	1	(10YR 6/6) stains; well	1	_	1
	I -	1		sorted; consolidated; fractured; firm; damp.	1	_	
	20						
Rema	arks	Log	gged by:	T. Murphy		Checked by:	MA
Proj	ect No				1		
	1061	206222		Hydro-Search,	inc.	Page 1 of 2	

Rocky Flats Plant

### LOG OF BORING NO. 33-86

Date Drilled 9/10/86

Coordinates N 36960.9 E 21896.5

Elev. feet	Depth (feet)	Sancia Graphic Type Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	20 40	Other Tests
	20				-	
	1		·		1 1 1	
	<del>-2</del> 5 -					
	- - -				-	
	-				_	
	30-		11.8-16.8'-Sample. Recovered 5.0/5.0'=100%. RQD 5.0/5.0'=100%. CLAYSTONE: grayish yellow green (5GY 7/2) to grayish olive green (5GY 3/2) with olive gray (5Y 3/2) to greenish gray (5GY 6/1) and dark yellowish orange (10YR 6/6) stains; well		-	
	- - 35-		sorted; consolidated; fractured; firm; damp.  TOTAL DEPTH: 16.8		- -	
	-					
	40				- - -	
Rema	ırks	Logged by:	T. Murphy		Checked by:	

WELL	33 <del>-</del> 86	

			ſ		ì		W	ELL _	J. <b>J</b>	00	
		<b>-</b> 0				WELL CONSTRU	JCTION S	UMM	ARY		
						LOCATION or COORDS: N 36960.8 E 21896.5	ELEVATION: GROUP		50	49.28' 50.70'	
					<b>M</b> s		TOPO	F CASIN	G	20.70	
	1 1	-2			4.9	DOUL INC CHANNEY					
					P.	DRILLING SUMMARY:	CONSTRUCTION				
						TOTAL DEPTH Well: 7.34' Hole: 16.80'		<u>51</u>	ART	FIN	ISH
				≣	0	BOREHOLE DIAMETER 7십"	TASK DRILLING:	<u>DATE</u> 1986	TIME	<u>DATE</u> 1986	TIME
		-4	سا		, ; ;	DRILLER <u>Boyles Brothers Drilling Co.</u> 15865 W. 5th Avenue	7년" auger	9/10_	1055	9/10	1130
					:	Golden, CO (Dave Jarvie)					
					52	Mah.: 1 - D 67					
_					-10	TC	GEOPHYS. LOGGING:	_=_			
8		İ			₹.∠	BIT(S) (	CASING:	0 /10	1210	0 (10	1017
Golden.	Murphy	<b>6</b>			٦٥	News	2" stainless	9/10	1310	9/10	1317
ğ	1 .1				5%	DRILLING FLUID None					
3	=			$\equiv$	, a						-
						SURFACE CASING 5" x 4' steel w/ locking F	FILTER PLACEMENT		1302	9/10	1305
					==	WELL DESIGN:	CEMENTING:	9/10	1331	9/10	1335
<u>N</u>	Z	<b>-8</b>				[	EVELOPMENT:	9/12	1530	9/12	1530
OCATION	PERSONNEL	1				BASIS: GEOLOGIC LOG GEOPHYSICAL LOG C	OTHER:				
0	Ë				==	CASING STRING(S): C=CASING S=SCREEN	Bentonite	9/10	1305	9/10	1310
	_							9/10	1250	9/10	1255
						2.99'- 7.34' SI					
		Ho			差						
		İ			三						
		1			芸		<u>'</u>		<del> 1</del>		
						\     \ \ \   \ \ \ \	WELL DEVELOP	MENI			
		12					See Well Devel	opment	Summary	Sheet.	
					三	CASING: CI 2" I.D. Sch. 5 type 316 stain-					
					==	less steel threaded and flush					
	lant					jointed.					
		Ì			=======================================					-	
	ats	L.				SCREEN: SI 2" I.D. Sch. 5 type 316 stain-		<del></del>			
106P06222	F	74				less steel, threaded and flush					
2	돷	ł			===	jointed, 0.010" wire wrap screen	COMMENTS:				
8	Rocky	İ			===	0.25' welded bottom cap.	No water encoun	torod d	urina di	rillina	
	-	l				CENTRALIZERS Type 304 stainless steel	to water encoun	rered o	urring u	· TTTTIIE.	
- 1		١.,			===	4.07' - 5.32'	Top of stainles	a ataal	annina	. 1 // 2	,
١		H6					TOD OF SCATIFIES	S SCEET	Casing	. 1.42	
PROJECT						FILTER MATERIAL 32-42 silica sand	Cave from TD to	16 /01			
õ					77	2.50' - 7.50'	cave from ID to	10.40			
ď.	- 1					CEMENT Portland Type I		•	<del></del>		
		,,				0.00' - 2.00'					
		<del>-</del> 18				OTHER 3/8" bentonite pellets					
						2.00' - 2.50'					<del></del>
		l				7.50' - 16.40'					
						7.50 - 10.40					
			20			HYDRO-SEARCH RENO-DENVER					
						THE TOTAL PRENO-DENVER	CONSULTING HY	DROLC	GISTS-	GEOLO	GISTS

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL Number	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3386	09/12/86	5949.28	5950.70	1.42	7.34	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					-1.00	DRY
	02/25/87					-1.00	DRY
	03/24/87					-1.00	DRY
	05/08/87					-1.00	DRY
	06/03/87					-1.00	DRY
	07/08/87					-1.00	DRY
	08/04/87					-1.00	DRY
	09/03/87					-1.00	DRY
	09/24/87					-1.00	DRY
	10/21/87					-1.00	DRY
	11/09/87					-1.00	DRY
	12/01/87					-1.00	DRY
	12/21/87					-1.00	DRY
	01/11/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY

#### INDEX OF DATA

Boring No.: 34-86								
Completed as well? Yes								
Data in File								
X Log of Borehole								
X Well Construction Summaries								
Well Development Summaries								
X Hydraulic Conductivity Test Data and Results								
X Packer Test Data and Results								
X Water Level Data								
Saturated Thickness Hydrographs								

Rocky Flats Plant

# LOG OF BORING NO.

Date Drilled 8/20/86, 8/26/86, 8/28/86

Boring Method Hollow Stem Auger/NC Core

Coordinates N 37171.4 E 23088.4 Ground Surface Elevation 5910.44'

Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/inch) 20 40	20 40	Other Tests
	0 _			VALLEY FILL	-		
	_			0-1.3'-Sample. Recovered			
				1.3/1.3'=100%. CLAY:			
				grayish olive (10Y 4/2) to light olive gray			
	_			(5Y 5/2) silty clay;			
				some sand, gravel and cobbles; subrounded;			
				poorly sorted; grasses at			
				surface; dry.		_	
	5			2.0-4.0'-Sample. Recovered	,		
	J , _			1.9/2.0'=95%. SILTY CLAY: moderate to dark yellowish		_	1
	I _			brown (10YR 6/2); white		_	<b>!</b>
				feldspar grains along with quartzite and granite		_	}
	_			particles; poorly sorted;		_	<b>]</b> .
	_			subangular; few roots; dry.		-	ł
	_			4.0-7.0'-Sample. Recovered	1	-	ì
	_	. /		0.0/3.0'=0%.			1
	<b>!</b>	ν,				-	ł
	<b>!</b> -	/		7.0-12.0'-Sample. Recovered 2.5/5.0'=50%.		-	1
	10	Y,		CLAYSTONE: olive gray		-	1
	-	/		(5Y 4/1); trace silt and sand; gravel lense at 8.6';		l -	1
	<b>}</b> -	V		grades downward into light	l	-	1
	- 1			olive gray (5Y 5/2) clay; large subrounded cobble at		-	1
	-	ľ	5000	bottom; soft; sticky; damp		-	1
	-	1/	0000	to moist.	1	-	1
	-	<b>f</b> /	10V0			-	1.
	-	1/	00	12.0-17.0'-Sample.		]	
	-	<b>1</b> /	nor	Recovered 2.7/5.0'=54%.		]	1
		1/	· · ·	12.0-16.1'. GRAVEL: light			]
	15-	1 /	1000	olive gray (5Y 5/2) with		]	1
	-	1/	Oo.	abundant pink granite and quartzite; poorly sorted;	1	] -	1
	1 -	1 /	عمر	angular to subangular; some sand; trace clay; wet.	1		1
		V	E	sand, trace cray; wet.		-	1
	1 -	] /		ARAPAHOE FORMATION		-	4
		V	<b></b>	4		-	4
		1/		l 16.1-17.0'. CLAYSTONE: dusky yellow (5Y 7/6);	1	-	4
	-	<b>√</b> ,		abundant medium light gray	I	-	-1
		1/		(N 6) horizontal mottles; well sorted; consolidated;	1	1	-
Remarks Logged by: T. Murphy & L. Pivonka Checked by:							
Project No.  Hydro-Search, Inc.  Page 1 of 6							

Rocky Flats Plant

# LOG OF BORING NO.

34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86
Boring Method Hollow Stem Auger/NC Core

Coordinates N 37171.4 E 23088.4

Ground Surface Elevation 5910.44'

Rou	Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5910.44'								
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Material Description	Penetration Resistance (Blows/Inch) 20 40	Colifeur	Other Tests		
	20								
	_			17.0-22.8'-Sample.					
	_			Recovered 4.8/4.8'=100%. CLAYSTONE: light olive					
	-			gray (5Y 5/2) clay with					
	_	r		some silt; dark yellowish		-			
	_			orange (10YR 6/6) mottles;		-			
				well sorted; firm; damp.		_			
				22.8-27.8'-Sample.					
				Recovered 5.0/5.0'=100%. CLAYSTONE: light olive	1				
				gray (5Y 5/2); some silt;					
	25	<b>/</b>		some dark yellowish orange		-			
	-			(10YR 6/6) mottles; well sorted; firm; damp.		-			
	_			ooleed, lilm, damp.		_			
	_					_			
		/		27.8-32.8'-Sample.			. !		
		/		Recovered 5.0/5.0'=100%. CLAYSTONE: light olive					
	_			gray (5Y 5/2) and medium		l	<b>[</b>		
	_	ľ /		gray (N 5); limonite stains		_	1		
	-	./		dark yellowish orange		_	1		
	_	V /		(10YR 6/6) abundant; black wood fragments common;		_			
	_			trace silt and sand; iron		l -			
	30	V		stain along fractures; well		l -	1		
	- 30-			sorted; firm; damp.			1		
	_								
		1 /			·	_			
	-	1/		32.8-37.8'-Sample. Recovered 5.0/5.0'=100%.		_			
	-	<b>1</b> /		CLAYSTONE: olive gray		_	1		
	-	1/		(5Y 3/2) with minor dark		-			
	_	Y /		yellowish orange (10YR 6/6) limonite stains; black wood		-	•		
	_			fragments common; trace		_			
		<i>V</i> .		silt and sand; well sorted;		_	1		
		1 /		firm; damp.		i _			
	25	V		1			]		
	<del></del> 35	1 /		I					
	-	1/							
	_	<b>f</b> /				_	1		
	-	1/		38.0-43.8'-Sample.		· ·	1		
	-	1 /	1	Recovered 5.8/5.8'=100%.		-	1		
	-	1/		CLAYSTONE: dark gray (N 3); silty with trace of		_	1		
	-	TIT		FeO stringers; some			1		
	-	4	=====	charcoal wood fragments;	i i	_	ł		
	l –	4		<pre>well sorted; consolidated; damp.</pre>					
	_	1				_	1		
	40			<u> </u>			11(1)		
Rema			ged by:	T. Murphy & L. Pivonka		Checked by:	W/A		
Proj	ect No.		- 1	Hydro-Soarch	Inc	1			
L	106P	06222		Hydro-Search,	Page 2 of 6				

Rocky Flats Plant

# LOG OF BORING NO.

Date Drilled 8/20/86, 8/26/86, 8/28/86

106P06222

Coordinates N 37171.4

E 23088.4

Page 3 of 6

43.8-45.0'-Sample.  Recovered 1.2/1.2'=100t. SAMDSTONE: dark gray (N 3); clay-rich; greenish gray (50f 6/1) clay; well sorted; consolidated; damp.  45.0-48.0'-Sample. Recovered 3.0/3.0'=100t. SAMDSTONE: medium gray (N 5) laminated sandstone 0.5' thick with dark gray (N 3) claystone interbeds 0.1" thick; some of the thicker laminae contain coal material; very light gray (N 8) sandy clasts within the lower 1.5'; well sorted; consolidated; damp.  48.0-52.3'-Sample. Recovered 0.2/4.3'=5t. SAMDSTONE; medium light gray (N 6); silty; laminated; well sorted; consolidated; damp.  52.3-53.4'-Sample. Recovered 1.0/1.0'=100t. SANDSTONE; medium light gray (N 6); silty; laminated; well sorted; consolidated; damp.  53.4-54.4'-Sample. Recovered 1.0/1.0'=100t. SANDSTONE: nedium gray (N 5); laminated; well sorted; consolidated; damp.  53.4-54.4'-Sample. Recovered 1.0/1.0'=100t. SANDSTONE: nedium gray (N 5); laminated; well carbonate; consolidated; damp.  53.4-54.4'-Sample. Recovered 1.0/1.0'=100t. SANDSTONE: nedium gray (N 5); laminated; well carbonate; consolidated; damp.
10/10

Hydro-Search, Inc.

Rocky Flats Plant

# LOG OF BORING NO.

34-86

Date Drilled 8/20/86, 8/26/86, 8/28/86
Boring Method Hollow Stem Auger/NC Core

Goordinates N 37171.4 E 23088.4 Ground Surface Elevation 5910.44'

Bori	ng Meti	hod	Hollow S	Stem Auger/NC Core Ground Su	rface Elevatio	m 5910.44'	
Elev. (feet)	Depth (feet)	Semple Type	Graphic Log	Meterial Description	Penetration Resistance (Blows/inch) 20 40	20 40	Other Tests
	60			S4.4-55.6'-Sample. Recovered 1.2/1.2'=100%. SANDSTONE: medium gray (N 5); laminated; well cemented with calcium carbonate; consolidated; damp.  55.6-59.3'-Sample. Recovered 3.7/3.7'=100%. CLAYSTONE: dark gray (N 3); variable quantities of silt and sand; abundant clay; consolidated; well sorted; firm; moist.  59.3-62.5'-Sample. Recovered 3.2/3.2'=100%. CLAYSTONE: dark gray (N 3); silty; light gray (N 7) mottling; firm; consolidated; well sorted; moist.  62.5-64.5'-Sample. Recovered 2.0/2.0'=100%. SANDSTONE: light gray (N 7) clay laminated sandstone; gradational contact; well sorted; consolidated; moist.  64.5-69.3'-Sample. Recovered 4.8/4.8'=100%. SANDSTONE: light gray (N 7) and medium light gray (N 6) silty sandstone with trace of wood fossils; sand content increases with depth; consolidated; well sorted; firm; dry.  69.3-71.0'-Sample. Recovered 1.7/1.7'=100%. CLAYSTONE: medium gray (N 5) silty and fine- grained sandy claystone; well sorted; firm; damp.		Checked by:	
Rem	arks	L	ogged by	T. Murphy & L. Pivonka		Glecked by	XXX
Pro	ject No	). Docum		Hvdro-Search	. Inc.	Page 4 of 6	

106P06222

Hydro-Search, Inc.

Page 4 of 6

Rocky Flats Plant

## LOG OF BORING NO.

**34**–86

Date Drilled 8/20/86, 8/26/86, 8/28/86
Boring Method Hollow Stem Auger/NC Core

Goordinates N 37171.4 E 23088.4 Ground Surface Elevation 5910.44'

Bori	Boring Method Hollow Stem Auger/NC Core Ground Surface Elevation 5919.44								
Elev. (feet)	Depth (feet)	Bernolog Type	raphk Log	Material Description	Penetration Resistance (Blows/inch) 20 40	Content 20 40	Other Tests		
	80			71.0-74.3'-Sample.					
	_			Recovered 3.3/3.3'=100%.					
	_			CLAYSTONE: dark gray		7			
	_		====	(N 3); blocky texture;		-			
				well sorted; firm; damp.		_			
	_			74.3-75.3'-Sample.					
	_			Recovered 0.6/1.0'=60%.		_			
	-			CLAYSTONE: dark gray	!	-			
	_	[		(N 3); grayish orange (10YR 7/4) mottles; well					
	_			sorted; consolidated; damp.		_			
	٥٠			, •					
	<del>8</del> 5 —	1		75.3-78.5'-Sample.			1 .		
	_	1     F		Recovered 3.2/3.2'=100%.			I		
	_	1   E		SANDSTONE: medium gray (N 5) silty sandstone; well		_	1		
	_	4     E		sorted; consolidated; damp.	]	_	i		
	_	]				_	ł		
				70 7 00 F1 75	•	_	ł		
	_	1     E	====	78.5-83.5'-Sample. Recovered 5.0/5.0'=100%.		_	1		
	_	1     E		CLAYSTONE: medium dark			ł		
	-			gray (N 4); blocky texture;		-	1		
	-			well sorted; consolidated;		-	1		
		<b>J</b>		damp.	•	-	ŧ		
	<del></del> 90				•	-	ł		
				83.5-86.0'-Sample.		_	l		
	I -			Recoverd 2.5/2.5'=100%.	l '	_			
	-	1		CLAYSTONE: medium dark					
	-	1     [		gray (N 4); blocky texture; trace of pale yellowish		i -	1		
	-	4	=====	orange (10YR 8/6) nodules;		-	1		
	-	4     1		well sorted; consolidated;		-	f		
	_	1		damp.		-	ł		
	1 _	]				-	·		
				86.0-86.6'-Sample.			Į		
	_	1		Recovered 0.6/0.6'=100%. CLAYSTONE: medium dark	I	l _	1		
	-	1		gray (N 4); blocky texture;					
	95 <b>-</b> -	┫╽╽╠		trace of pale yellowish	1	_	1		
	-	┫╽╽┋		orange (10YR 8/6) nodules;	1	-	1		
	l –	▋▏▏▐		<pre>well sorted; consolidated; damp.</pre>		-	1		
	l -	4				-	-		
	_	▋▏▐		86.6-89.0'-Sample.		-	4		
	I –	<b>╗</b> ╽╽┋		Recovered 2.4/2.4'=100%.	1		1		
	1 -	7     [		CLAYSTONE: greenish gray	1				
		<b>1</b>     <b>!</b>		(5GY 6/1) silty sandstone with clay laminae; well		Ī	1		
	1 -	-     [		sorted; consolidated; damp.	1	1 -	7		
	-	-			1	l -	1		
		4			1		1		
	100						VIP		
Rem			ed by:	T. Murphy & L. Pivonka		Checked by:	#201		
Proj	ect No	•		Hydro-Search,	inc				
	106P	206222		riyuru—Search,	1110.	Page 5 of 6			

Rocky Flats Plant

# LOG OF BORING NO.

34-86

Date Drilled 8/20/86, 8/26/86,8/28/86

Coordinates N 37174.4 E 23088.4

96.0-100.0'-Sample. Recovered 4.0/4.0'-1002. CLAYSTONE: Sedium dark gray (N.4); graydational contact; some very fine- grained sand; vell sorted; consolidated; damp.  TOTAL DEPTH: 100.0'	Elev. (feet)	Depth (feet)	Sample Graphi Type Log	Material Description	Penetration Resistance (Blows/inch) 20 40	င်စ်ရုံနိုင်ငံ 20 40	Other
Recovered 4.0/4.0'-100%.  CLAYSTONE: medium dark - gray (N 4); gradational contact; some very fine-grained sand; well sorted; consolidated; damp.  TOTAL DEPTH: 100.0'							
CLAYSTONE: medium dark gray (N 4); gradational contact; some very fine- grained sand; well sorted; consolidated; damp.  TOTAL DEPTH: 100.0'	I	_		96.0-100.0'-Sample.	•		
gray (N 4); gradational contact; some very fine- grained sand; well sorted; consolidated; damp.  TOTAL DEPTH: 100.0'		-		Recovered 4.0/4.0'=100%. CLAYSTONE: medium dark		_	
grained sand; well sorted; consolidated; damp.  TOTAL DEPTH: 100.0'		-		gray (N 4); gradational		_	
TOTAL DEPTH: 100.0'				grained sand: well sorted:		-	
-116- -116- -117-				1			
-110- 				TOTAL DEPTH: 100.0'			
-110- 	ı	-		i		-	
	ŀ	105				_	
—115——————————————————————————————————		4				_	
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Remarks Logged by: Checked by:	lema:		Logged by:			Checked by:	NO

WFII 34-8	6
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### WELL CONSTRUCTION SUMMARY

- LOCATION or COORDS:	ELEVATION: GROUP	ND LEVE	59	10.44'	
N 37171.4 E 23088.4		F CASIN		12.78'	
DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
W-11 - EC 251 W 1 - 100 001		ST.	ART	i Fin	IISH
TOTAL DEPTH Well: 56.25' Hole: 100.00'	TASK		 		<del></del>
BOREHOLE DIAMETER 0.00' - 37.80': 75"		<u>DATE</u> 1986	TIME	1986	TIME
<u>37.80' - 100.00': 4 3/4"</u>	DRILLING:			l	
DRILLER Boyles Brothers Drilling Co.	7½" auger	8/20	1251	8/20	1545
15865 W. 5th Avenue, Golden	4 3/4" core	8/26	1503	9/2	1202
(David Jarvie, Jim Horn)					
RIGMobile B-57	GEOPHYS. LOGGING:	_=			
BIT(S) 0.00' - 37.80': Blade bit	CASING:		į į		
37.80' - 100.00': Bull nose rock bit	5" steel	8/21	_0800_	8/21	1335
DRILLING FLUID None	2" stainless	9/3	_0845	9/3	0900_
SUPERCE CARING 5" y // 8! steel y/ looking		0 /2	0900	9/3	1145
SURFACE CASING 5" x 40.8' steel w/ locking		9/2	1604	9/2	1716
WELL DESIGN:	CEMENTING:	9/5	1000	9/12	1015
	CEVELOPMENT:	9/3	1000	3/12	1015
BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER: Cementing 5" casing	9/21	1359	8/21	1456
CASING STRING(S): C=CASING S=SCREEN _0.00' _37.80' C1					
0.00' 37.80' C1	Lower cement	9/3	1150	9/3	1210
	Bentonite	9/3	0823	$\frac{9/3}{0.00}$	0845
<u>44.24'56.25' S1</u>	Parless tract	9/3	1145	9/3	1150
	Pac <u>ker test</u>	8/29	1056	8/29	1725
	See Well Develo		unmary	Sheet	
CASING: CI_5" I.D. steel					
c2 2" I.D., Sch. 5 type 316 stain-					
less steel, threaded and flush					······································
iointed.				-	
SCREEN: SI 2" I.D., Sch. 5 type 316 stain-					
less steel, threaded and flush					
jointed, 0.010" wire wrap screen	COMMENTS:				,
0.25' welded bottom cap.	Water encounter	ed at 4	8.0' du	ring dr	illing.
CENTRALIZERS Type 304 stainless steel					
<u> 22.47' - 23.70'</u>	Top of stainles	s steel	casing	2.3	41
49.01' - 50.26'				•	
FILTER MATERIAL 32-42 silica sand	Cave from T.D.	to 90.0	)'		
43.00' - 56.50'					
CEMENT Portland Type I 0.00' - 42.00'; 90.00' - 64.50'					!
OTHER 3/8" bentonite pellets					
42.00' - 43.00'					
56.50' - 64.50'	-		·	<del></del>	
	<del> </del>				

HYDRO-SEARCH RENO-DENVER

PERSONNEL T. Murphy/L. Pivonka Colden, CO

LOCATION \_

Rocky Flats Plant

106P06222

PROJECT \_\_

90

CONSULTING HYDROLOGISTS-GEOLOGISTS

# WESTER

CLIENT/SUBJECT				W.O. NO	
TASK DESCRIPTION				TASK	NO
PREPARED BY	DEPT	DATE	6/21/88		OVED BY
METHOD REV. BY	DEPT	DATE	6/21/8	DEPT	DATE
	WE	11 34	1-86		
Hydraulic	Conductivit	y (cm)	= (292	3.1 × 10-1	<b>4</b>
Flowrate	(gpm) =	0,409			
Screened	Interval	(ft below	G.L.) =	44,24-	56,25
	44.24 - 55,6 - 3		sandston clayst		

Method of Analysis: Residual - drawdown Plot

(Driscoll, 1986 - pg 256.)



CLIENT/SUBJECT		W.O. NO	
TASK DESCRIPTION			
PREPARED BY			
			DEPT DATE

WELL 34-86

$$T (gpd/ft) = \frac{264Q}{DS'} = \frac{(264)(409)}{137} = .788$$

where Q (gpm) = 9 gallons/22 minutes = 0.409 gpm

= 137ft/longycle(see attached pist)

SHEET\_\_\_\_ of \_

$$K(gpd/ft^2) = T/b = .788/12.01 = 6.56x10^{-2}$$
  
where  $b(ft) = 12.01$ 

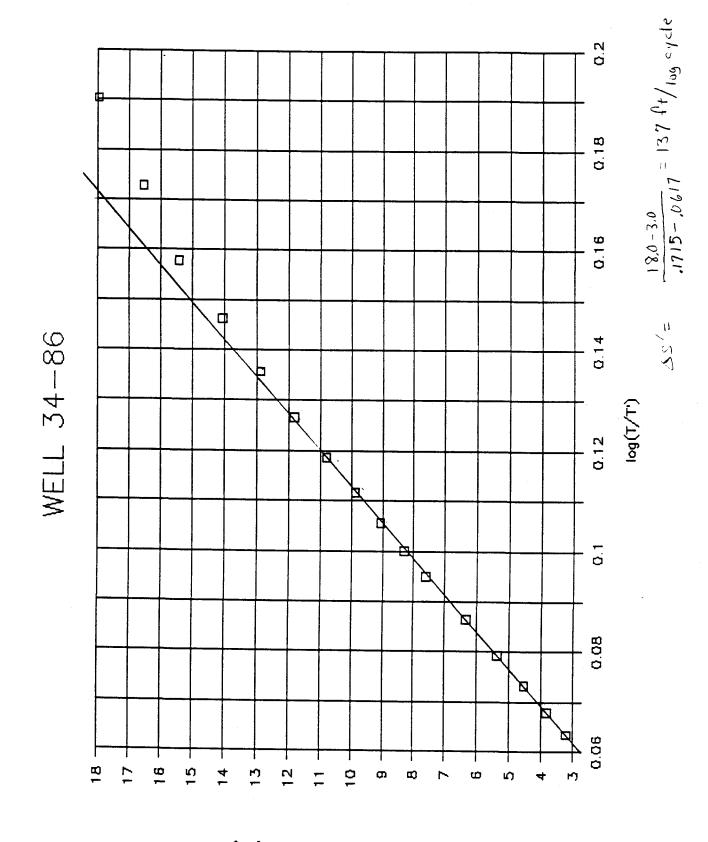
This method is varid where u < 0.01 solving for t for u < 0.01.

$$t(min) = \frac{r^2 S}{4 + u} = \frac{(0.198)^2 10^{-3}}{4 (.788)(.01)} \times \frac{1440min}{4n_1} \times \frac{7.482 \text{ cal}}{61^3}$$

$$= 13 \qquad minutes$$

where 
$$r(ft) = (\frac{41.75}{24})ft = (0.198)ft$$

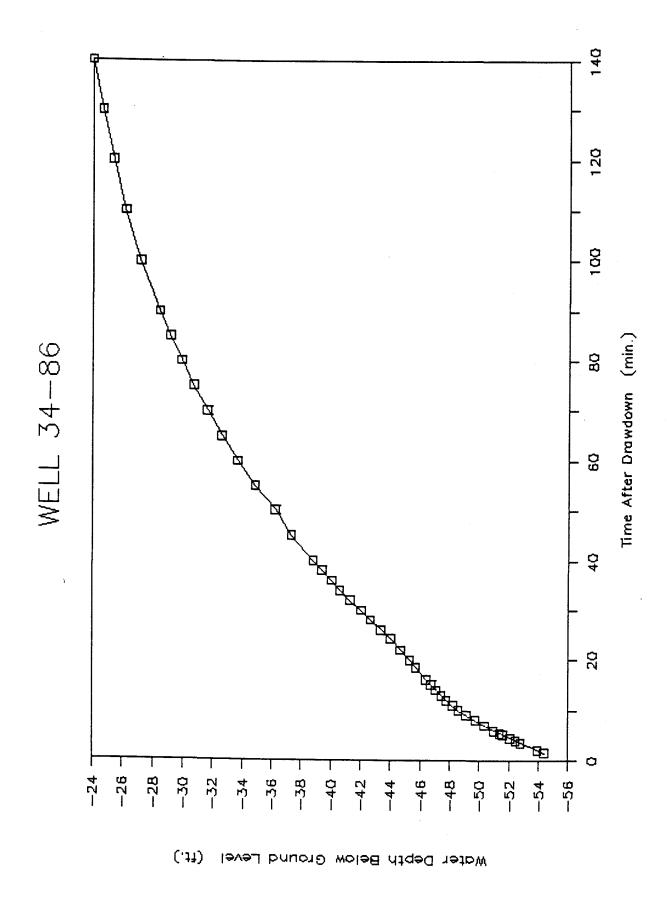
 $\mathcal{J} = 10^{-3}$  assumed S for confined aquifer  $\Delta S'$  is based on paints where  $t \ge 70$  min.



Residual Drawdown (ft.)

ф 日 WELL 34-86 10000 32 30 28 26 24 22 20 18 4 10 12 口 ψ N

Residual Drawdown (ft.)



T Time (min.)	T' T Prime (min.)	ELL 34-8 Water Level (ft.)	6 s' Rsd Drwdn (ft.)	log(T/T')
(min.)  23.50 24.10 25.50 26.00 26.50 27.20 27.50 28.00 29.00 30.00 31.00 32.00 33.00 34.00 35.00			(ft.)  33.59  33.11  31.97  31.64  31.26  30.79  30.57  30.17  29.55  28.93  28.31  27.78  27.40  26.97  26.60	1.19 1.06 0.86 0.81 0.77 0.72 0.70 0.67 0.62 0.57 0.54 0.51 0.48 0.45
36.00 37.00 38.00 40.50 42.00 44.00 46.30 48.00 50.00 52.00 54.00 56.00 58.00 60.00	14.00 15.00 16.00 18.50 20.00 22.00 24.30 26.00 28.00 30.00 32.00 34.00 36.00 38.00	47.06 46.75 46.41 45.69 45.29 44.68 44.02 43.37 42.64 42.03 41.30 40.62 40.05 39.42	26.26 25.95 25.61 24.89 24.49 23.88 23.22 22.57 21.84 21.23 20.50 19.82 19.25 18.62	0.41 0.39 0.38 0.34 0.32 0.30 0.28 0.27 0.25 0.24 0.23 0.22 0.21
62.00 67.00 72.20 77.00 82.00 87.00 92.00 102.00 107.00 112.00 132.00 142.00 152.00	40.00 45.00 50.20 55.00 60.00 65.00 70.00 75.00 80.00 90.00 100.00 110.00 120.00 140.00	38.77 37.33 36.21 34.85 33.68 32.62 31.60 30.68 29.87 29.12 28.42 27.15 26.18 25.36 24.64 24.02	17.97 16.53 15.41 14.05 12.88 11.82 10.80 9.88 9.07 8.32 7.62 6.35 5.38 4.56 3.84 3.22	0.19 0.17 0.16 0.15 0.14 0.13 0.12 0.11 0.11 0.10 0.09 0.09 0.09 0.08 0.07 0.07 0.06

### AQUIFER TEST DATA

PUMBING OF OBSERVATION WELL PUMPING OF RECOVERY DATA TYPE OF AQUIFER TEST\_ PAGE HOW Q MEASURED\_ HOW W. L.'s MEASURED -9:18 time RAD./DIST. OF/FROM PUMPING WELL CASINOUMP OFF: date 9-29-80 9140 time. MEAS. POINT FOR W.L.'s -MIN DURATION OF AQUIFER TEST\_ 158. ELEVATION OF MEAS. POINT.

	t=_	TIM aa	1E at t	′= o	STATIC	WATER L	R LEVEL	~ ~ ~ ~ ^ /	 DISCH	IARGE	ORDED BY	COMMENTS
Đ	CLOCK		n'a		READING	CONVERSIONS CORRECTIONS	WATER	s or s'	READ-	Q	REC	
/	0831		77.74		20+3.15		20.80	11/4			OP	ORIGINAL W.
	0918	Ø			20+2.85		20.50	0.30			Ţ	START Bailing
	0921:20	3.3							200		11	Bailed 2 GAL
	225:15	7.25							2			Builed 2 GAL
	9:30.05	12.1							 2 ast		٠,	Bailed 26me
	9.36:35	18.6							2 94			Builto 2 600
	9:40:00		0						1 and		.,	Bailed   64L STOPPED BAILING
	7:41:30	23.5	1.5		55+1.74		54.39	-33.59	,			90% RECOVERING ME
_	9:42 04		2.1		55+1.26			-33.11			٠.	
	7:42:34	24,6	2.6		55-0.01			-31.84			٠,	
	7:43:00	25	3		55+0.46		53.11	- 32 31			. 1	
	9.43:30	25.5	3.5		55+012	1.	52.77	-3190				
	9:44:00	26	4		55-0.21	,,	52 44	-31.64			• • •	
	9.44:30	26.5	4.5		50+4.41	,,	5206	-31.26			11	
	9.450	27.2	5.2		50+394		51.59	- 30.79			14	
	9:45:33		5.5		50 + 3.72		51.37	- 30.57			14	
	9:46:0		6		50 + 3.32	٠,	50.97	-30.17				
	9.47:00		7		50+2.70	,	50.35	- 29.55			.;	
	9:48	30	3		50+2.08	11	49.73	- 28.93			٠.	
	9:49	31	9		50+1.46		49.11	-28.31				
	9:50	32	10		50 +0.93	11	48.58	-27.78			.,	
	9:51	33	//		50 + 0.55		48,20				,.	
	9:52	34	12		50 + 0.12	, .	47.77	6.97			١,	
	9.53	35	13		45+475	,,	47.40	-26.60			,.	
	9:54	36	14		451 4.41	"	47.06	-26.26				
	9:55	37	15		45+4.10	′′	46.75	-25.95			71	
	9:56	38	16		45+3.76	,,		.25.61			11	
	9:58:3	40.5	18.5		45+3.04	"		-24.89			14	
	1000	42	20		45+264	,		-24.49			4	
	1062	44	22		4512.03			- 23.88			-,	
	1009:1	5 46.25	24.25		45+1.37			-23.72			ι,	
	1006	49	26		45 - 0.72	'',,	43.37				٠,	
	1500	50	28		45-0.01	11	42.64	-21.84			,,	
	1010	<i>5</i> 2	30		40+438	٠.,	42.03	-21.23			.,	
	IUIZ	54	32		40 + 3.65	,	91.30	-20.50			-1	
	1014	56	34		40+2.97	"	40.62	-19.82			tı	
	1016	58	36		40 +2.40		40.05	-1925			7.	
	1018	40	38		40+1.77	٠,	39.42	-/8.6Z			١,	
	1020	62	10		40+1.12		38.77	- 17.97			١,	
	10:25		45		35+468	-,,	37.33	-16.53			7	
		72.2	50.2		35 + 356		36.21	-15.41			`	

34-86

## AQUIFER TEST DATA

PUMPING OF DESERVATION WELL
PUMPING OF RECOVERY DATA

TYPE OF AQUIFER TEST BAILDOWN - KECOVERY TE HOW Q MEASURED 4/2 BAILON BUCKET	57 PUMPING	OF
HOW W.L.'S MEASURED	PUMP ON: date 9-29-86	time 9:18 time 9:40 158.6 MIN

	t =	TIM <i>⋧</i> ⋧		′ = o		WATER L		DATA 20,80	, ′	DISCH	ARGE	ECORDED BY	COMMENTS
O A Y	CLOCK	M'W	t'		READING	CORRECTIONS	WATER	s or s'		READ-	q	REC	
1	0831		277.15		20+3.15		20.80	11/4				OP	ORIGINAL W.
_	0918	ø			20+2.85		20.50	0.30				,,	START Bailing
	0921:20									200		1,1	Bailed 2 GAL
	225.15	7.25								2 /11		,,	Builed 2 GAL
	7:50.05	12.1								2 / 1		7,	Bailed 26m
	9.36.35	18.6								2 901			Built 1602
	9:40:00	22	Ø							1 and		٠,	Bailed   GAL STOPPED BAILING
	7:41:30		1.5		55+1.74		54.39	-33.59					90% RECOVERED MY 2
	9:42 04		2.1		55+1.26	.,	53.91	-33.11				٠.	
_	7:92:34		2.6		55-0.01			-31.84				٠,	
	9:43:00	25	3		55+0.46	,,	53.11	- 32.31				.,	
	9.43.50	25.5	3.5		55+012		52.77	-3190					
	9:44:00	26	4		55-0.21	1.	52 44	-31.64				٠,	
	9.44:30	26.5	4.5		50+4.41	,,	5206	-31.26				"	
	9:450		5.2		50+394		51.59	- 30.79				ja .	
	9:45:33		5.5		50 +3.72		51.37	. 30.57				14	
	9:46:0		6		50 + 3.32	.,	50.97	-30.17				-4	
	9.47:00	29	2		50+2.70	,	50.35	- 29.55					
	9:48	30	9		50+2.08	"	49.73	-28.93				١.	
_	9 49	31	9		50+146		49.11	-28.31				٠.	
_	9:50	32	10		5010.93	11	48.58	-27.78				,,	
	9:51	33	//		50 - 0.55		48,20					11	
_	9:52	34	12		50 + 0.12	7.	47.17	-=6.97				1.	
	9.53	35	13		45+475	,,	47.40	-26.60				11	
_	9:54	36	14		45 + 4.41	"	47.06	-26.26				,,_	
	9.55	37	15		45+4.10	('	46.75					"	
	9:56	38	16		45+3.76	,,	46.41						
	958:3		18.5		45+3.04	,,		-24.89				٠,	
	1000	42	20		45+269			-24.49				Ą	
	1062	44	22		4512.03			- 23.88				- 1	
		5 41.25			45+1.37	.,		-23.22	7.0			1,	
	1006	49	26		45-0.72	• ' ',	43.37	-22.57				'1	
	1508	50	28		45-0.01	"	42.64	-21.84				,	
	1010	<i>5</i> 2	30		40+438	,	42.03	-21.23					
	JUIZ	54	32		40+3.65	,	41.30	-20.50				÷	
Г	1014	56	34		40+2.97		40.62	-19.82				łı	
	1014	58	34		40 +2.40		40.05	-19 25				:	
	1018	40	38		40+1.77	',	39.42	-/8.62					
_	1020	62	10		40+1.12		38.77	-17.97	-			11	
_	10:25	67	45		35+468	,	37.33	-16.53				-1	
_	1,000	<del></del>	50 2		25-356		31 21	-15-01				۲	

LOCATION PERSONNEL

PROJECT

PACKER TEST ANALYSIS
WELL NO. 34-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/29/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 46.01 - 56.00 MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.46

Q L K = ----- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00165170 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 3.50 \* 2.31 = 31.84

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000341 FT/MIN

K = .00000173 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .000000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 10.00 \* 2.31 = 46.86

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000000 FT/MIN

K = .000000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00601109 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 3.50 \* 2.31 = 31.84

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001240 FT/MIN

K = .00000630 CM/SEC

PACKER TEST ANALYSIS
WELL NO. 34-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/29/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 55.01 - 65.00

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEFTH TO WATER (FEET BELOW G.S.): 20.46

Q L K = ----- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

= 20.46 + 3.30 + 3.00 \* 2.31 = 30.69 R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000815 FT/MIN

P2/3 TEST

Q = INJECTION RATE = .00902772 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 12.50 \* 2.31 = 52.63

K = .00000414 CM/SEC

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00001127 FT/MIN K = .00000573 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00143508 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.99 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 3.00 \* 2.31 = 30.69

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000307 FT/MIN K = .00000156 CM/SEC

FACKER TEST ANALYSIS
WELL NO. 34-86

ROCKY FLATS FLANT JOB NO. 104P06222

DATE TESTED: 8/29/86 BY: L. PIVONKA
TEST INTERVAL (FEET BELOW G.S.): 76.71 - 86.70

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.46

Q L K = ----- LN(--) 2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00077169 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + 13.50 \* 2.31 = 54.94

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000092 FT/MIN

K = .00000047 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .000000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + .00 \* 2.31 = 23.76

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .000000000 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 3.30 + .00 \* 2.31 = 23.76

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000000 FT/MIN

K = .000000000 CM/SEC

PACKER TEST ANALYSIS WELL NO. 34-86

ROCKY FLATS PLANT JOB NO. 106P06222

DATE TESTED: 8/29/86 BY: L. PIVONKA

TEST INTERVAL (FEET BELOW G.S.): 85.10 - 95.09

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 20.46

Q L K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00054154 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 2.80 + 4.00 \* 2.31 = 32.50

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000109 FT/MIN

K = .00000056 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00860736 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 2.80 + 19.00 \* 2.31 = 67.15

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .00000842 FT/MIN

K = .00000428 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .000000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.99 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 20.46 + 2.80 + 4.00 \* 2.31 = 32.50

R = BOREHOLE RADIUS = .16 FEET

K = HYDRAULIC CONDUCTIVITY = .000000000 FT/MIN

K = .00000000 CM/SEC

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

3486 09/05/86 5910.44 5912.78 2.34 56.25 22.38 5890.40 09/08/86 22.40 5890.38 09/09/86 22.63 5890.15 09/10/86 22.77 5890.00	ON
09/09/86       22.63       5890.15         09/10/86       22.77       5890.00	0
09/10/86 22.77 5890.0	8
	5
	11
09/11/86 23.48 5889.30	0
09/12/86 24.25 5888.53	3
10/13/86 22.96 5889.83	32
<b>11/26/86</b> 22.77 5890.0°	)1
01/01/87 22.38 5890.40	0
<b>02/01/87</b> 22.17 5890.6	51
<b>03/17/87</b> 22.05 5890.73	3
<b>05/08/87</b> 21.98 5890.80	30
<b>06/02/87</b> 22.80 5889.98	8
07/07/87 21.65 5891.13	3
07/27/87 22.10 5890.60	8
<b>08/04/87</b> 22.40 5890.38	88
09/01/87 22.20 5890.50	8
09/29/87 22.40 5890.30	88
11/03/87 23.50 5889.20	28
12/01/87 22.26 5890.5	52
12/21/87 23.30 5889.40	8
01/11/88 22.10 5890.60	58
02/29/88 22.00 5890.73	78
<b>03/21/88</b> 22.00 5890.7	78
<b>04/18/88</b> 21.90 5890.80	38

#### INDEX OF DATA

Boring No.: 35-86						
Completed as well? Yes						
Data in File						
X Log of Borehole						
X Well Construction Summaries						
Well Development Summaries						
X Hydraulic Conductivity Test Data and Results						
Packer Test Data and Results						
X Water Level Data						
Saturated Thickness Hydrographs						

Rocky Flats Plant

# LOG OF BORING NO. 35-86

Date Drilled 8/19/86

Boring Method Hollow Stem Auger

Coordinates N 37177.0 E 23114.4 Ground Surface Elevation 5909.2

	Depth (feet)				Penetration Resistance (Blows/Inch) 20 40	Content Content 20 40	Other Tests
	0			VALLEY FILL ALLUVIUM			
						_	
	-	_		0-2.0'-Sample. Recovered 2.0/2.0'=100%.		_	
	~		=====	CLAY: olive gray (5Y		_	
	_	r /		3/2); dark yellowish		_	
	-			orange (10YR 6/6) mot- tles; grades downward			
	<b>i</b> -	<i>'</i>		into dark yellowish			]
	-	1/		brown (10YR 4/2) clay;		•	1
	-	r,		some silt; trace gravel and cobble size clasts		-	1
	_			of quartzite and granite;		-	1
	L	V		subangular to subrounded;		-	1
	,	1 /		dry to damp.		_	-
		$V_{-}$		2.0-2.7'-Sample. Recovered	1	-	1
	-	/	<b>1</b>	0.7/0.7'=100%. CLAY: dark		-	-
	-	1/		yellowish brown (10YR 4/2);			1
	_	<b>1</b> /	<b>1</b>	dark yellowish orange (10YR 6/6) mottles common;			1
	-	1/		some silt; trace gravel and		_	1
	-	ł,		cobble size clasts of			
	-	1./		quartzite and granite;	į .	1	1
	_	V		subangular to subrounded; dry to damp.	1	•	1
	l .	] /					1
	10-	$\nu$		2.7-3.7'-Sample. Recovered	1 .	i .	-{
	10-	1 /		0.0/0.7'=0%.			4
		1/		3.7-5.7'-Sample. Recovered			-1
	-	1 /		2.0/2.0'=100%.			4
	1	1/		3.7-5.0'. CLAY: dark	1		_
	-	ď,		yellowish brown (10YR 4/2);	ł		
	1 .	┨/		dark yellowish orange	1		7
	-	1		(10YR 6/6) mottles common; some silt; trace gravel and		1	7 .
		┩ /		cobble size clasts of	1	<u> </u>	1
	_	-V		quartzite and granite;			1
		┛ /		subangular to subrounded; dry to damp.	1		-
	15_	$\mathbf{I}$					-1
	15-	Π /	<b>1</b>	5.0-5.7'. CLAY: light			4
	1	7/		olive gray (5Y 5/2); silty; well sorted;			4
	1 -	1 /		firm; damp to moist.		i	4
	1	<b>1</b> /	====	S 5 7 6 51 No semble			_
	1 -	-1		5.7-6.5'. No sample. Depth correction.	į.		
		┫ ∕					
	-	<del></del>	_	6.5-8.5'-Sample. Recovere		1	
		4		1.7/2.0'=85%. CLAY: oliv black (5Y 2/1); silt;	е	1	
	1 .	4	1	trace sand and gravel;	1		7
		4	1	moderately well sorted;	1	1	1
	20	1		soft; wet.		Checked by:	JAP
	narks		ogged by	: T. Murphy		checked by:	
Pro	oject No 106	<b>o.</b> 5P06222		Hydro-Search	, Inc.	Page 1 of 2	

Rocky Flats Plant

# LOG OF BORING NO. 35-86

Date Drilled 8/19/86

Boring Method Hollow Stem Auger

Coordinates N 37177.0 E 23114.4

Ground Surface Elevation 5909.2

Boring Method Hollow Stem Auger Ground Surface Elevation 3909.2								
Elev. (feet)	Depth (feet)	Sample Type	Septition Log	Material Description	Penetration Resistance (Blows/Inche 20 40	20 40	Other Tests	
	20							
	_			8.5-10.5'-Sample.				
	-			Recovered 2.0/2.0'=100%. CLAY: olive black (5Y				
	_	1 1		2/1) to light olive gray		_		
	-	l 1		(5Y 5/2); silty with gravel lenses; trace		_	1	
	_	{		fine-grained sand;		_	<b>i</b> i	
	_	1 1		poorly sorted; subangu- lar; firm; wet.		-	1 1	
	_	1 1		Idi, IIIM, Wet.		-	1	
	-	1 1		ARAPAHOE FORMATION			1	
	2:5	] ]		AMPRIOL TOMATION		-	1	
	25 •	1 1		10 F-12 FI-Comple		-	1	
	_	j l		10.5-12.5'-Sample. Recovered 2.0/2.0'=100%.		-	1	
	_	1 1		CLAY: light olive gray		-	1	
	l _	1 1		(5Y 5/2); dark yellowish orange (10YR 6/6) mot-	Ì	-	1 1	
	] _	4 I		tles; sand layer at 12.0-	l .	-	1	
	_	] ]		12.5'; fine-grained; silty; moist; firm.		-	1	
	_	].		22207, 20200, 2020.		-	1	
	_	] ]		12.5-14.0'-Sample.		-	-	
				Recovered 1.5/1.5'=100%. CLAYSTONE: light olive		-	1 .	
	L	]		gray (5Y 5/2); dark		-	4	
	30	]		yellowish orange (10YR 6/6) mottles; no gravel;		-		
	1	1		silty; firm; moist.	l .		-1	
	-	1		_		-	4	
	1 -	1	ľ	14.0-16.0'-Sample. Recovered 2.0/2.0'=100%.	1	-	-1	
	I –	1		CLAYSTONE: light olive	Ì		4	
	1	1	l	gray (5Y 5/2); dark yellowish orange (10YR	ł		4	
	_	1	1	6/6) mottles; no gravel;		_	4	
	1 -	1	l	silty; layers of iron- stone; firm; moist.	1		4	
	-	1		scone; iirm; moisc.		1 .	1	
	1	1	1	16.0-18.0'-Sample.	1		4	
	35	1		Recovered 1.8/2.0'=90%. CLAYSTONE: pale olive	1		4	
	1 .	1		(10Y 6/2) to light olive	1	1 .	1	
	-	1	l	gray (5Y 5/2); minor dark yellowish orange (10YR			1	
	1 .	1		6/6) mottling; apparent	1		1	
	1 -	1	1	bedding due to color	1	1		
	1 '	1	1	variations; firm; damp to moist.	ı			
	-	1	1			]	]	
	1	1	1	1				
•	1 -	1	l	TOTAL DEPTH: 18.0'	l .	1	]	
	40	5	1					
Rem	narks		ged by:	T. Murphy		Checked by:		
Pro	ject No	).						
l '''	-	P06222		Hydro-Search	, Inc.	Page 2 of 2		

WELL	35 <del>-</del> 86	

	0			<i>z</i>	WELLOONOTE	LICTION OF		A 1734		
					WELL CONSTR	RUCTION S	UMM		<b>.</b>	
					LOCATION or COORDS:			50	09.20' 11.54'	,
	ŀ				N 37177.0 E 23114.4	TOP O	F CASIN	3		
11	- 2	<i></i>		薑	DRILLING SUMMARY:	CONSTRUCTION	TIME	LOG:		
					TOTAL DEPTH Well: 11.60' Hole: 18.00'	TACY	<u>ST.</u>	ART	FIN	ISH
					BOREHOLE DIAMETER 74"	TASK	<u>DATE</u> 1986	TIME	DATE 1986	TIME
	١,				ORILLER Boyles Brothers Drilling Co.	DRILLING: 7½" auger	8/19	1258	8/19	1558
	<b>1</b> 4				15865 W. 5th Avenue					
			≣		Golden, CO (Dave Jarvie)					
					RIG <u>Mobile B-57</u> BIT(S) <u>T5</u>	GEOPHYS. LOGGING: CASING:				
.	_6				611(5)	2" stainless	8/20	1012	8/20	1015
Murphy					DRILLING FLUID None					
					suprace cacuse 5" x 5" steel w/ locking	FILTER PLACEMENT	8/20	1015	8/10	1020
_  `					SURFACE CASING 5" x 5' steel w/ locking	CEMENTING:	8/20	1025	8/20	1040
ON .	8				WELL DESIGN:	DEVELOPMENT:	9/3	1000	9/11	1155
LOCATION PERSONNEL					BASIS: GEOLOGIC LOG X GEOPHYSICAL LOG	OTHER:	8/20_	1020	8/20	1025
LO PE		/		目	CASING STRING(S): C=CASING S=SCREEN  Q.00' 4.86' C1	<u>Bentonite</u>	8/20	1008	8/20	1012
					4.86' - 11.60' S1					
	-10									
11					·					
						WELL DEVELOR	PMENT			
		Ŀ				See Well Deve	lormont	Summara	Sheet	
	12				CASING: CI_2" I.D. Sch. 5 type 316 stain-		торцепс	Summer	oneer.	<del></del>
					c2 less steel, threaded and flush		,			
					c3 jointed.					
ant	,,			莒	SCREEN: SI 2" I.D. Sch. 5 type 316 stain-		-,			
2 ats Plant	14				s2 less steel, threaded and flush	COMMENTS:				
222 Flat				固	s3 jointed, 0.010" wire wrap screen	Water encount	d	8 0! A	rina dr	illina
106P06222 Rocky Fla				莒	S4 0.25' welded bottom cap.  CENTRALIZERS Type 304 stainless steel	water encount	ered at	0.0 ac	it trig dr	IIIIIIZ.
9 2	<b>L</b> 16			莒	7.80' - 8.85'	Top of stainl	ess ste	el c <u>asi</u>	ng: 2.3	4'
5				莒	16 (0.11)		- 1/ 2	<u> </u>	<del> </del>	
PROJECT				固	FILTER MATERIAL 16-40 silica sand 2.90' - 12.60'	Cave from TD	10 14.2	<u> </u>		
<u>a</u> 1				莒	CEMENT Portland Type I					
	_18	<u> </u>		杅	0.00' - 1.95'					
					OTHER 3/8" bentonite pellets 1.95' - 2.90'				<del></del>	
					12.60' - 14.20'					
	-20				HYDRO-SEARCH RENO*DENVER	CONSULTING H	YDROL	OGISTS	-GEOL	GISTS



CLIENT/SUBJECT			W.O. NO		
TASK DESCRIPTION			TA	SK NO	
PREPARED BY	DEPT	DATE	AI	PPROVED BY	
MATH CHECK BY	DEPT	DATE			
METHOD DEV. DV	DEDT	DATE	DEDT	DATE	

WELL 35-86

Hydraulic Conductivity (cm/sec) = NA

Flowrate (gpm) =

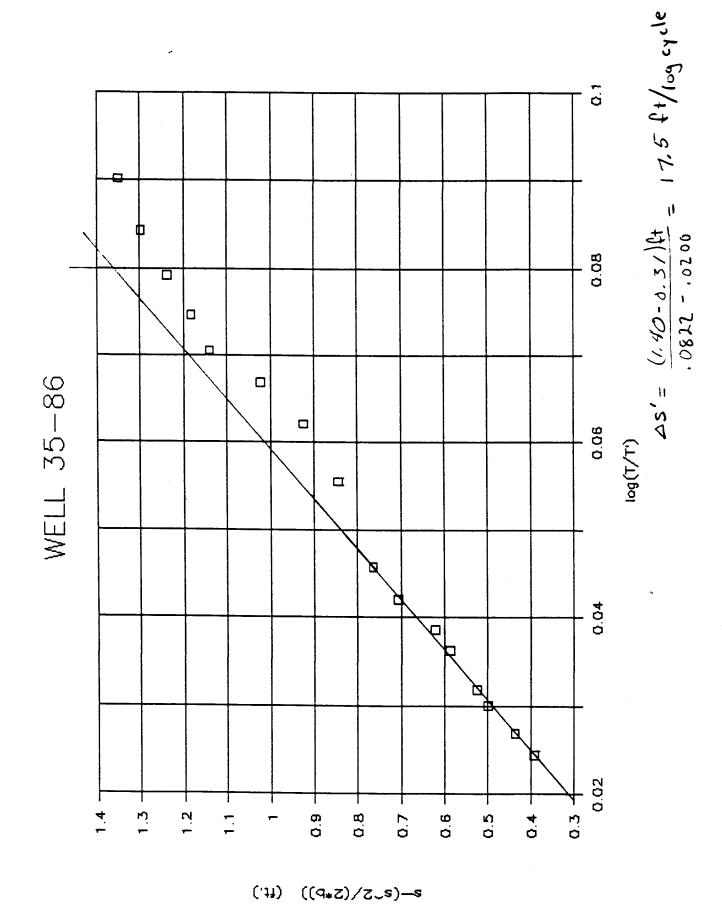
Screened Interval (ft below G.L.) =

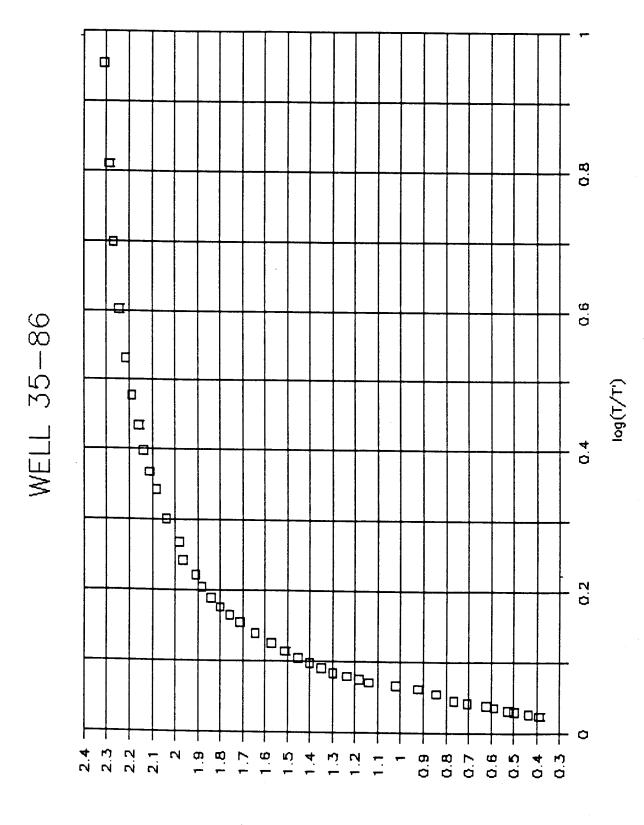
Method of Analysis: Kesidual - drawdown Plot

(Driscoll, 1986 - pg 256.)

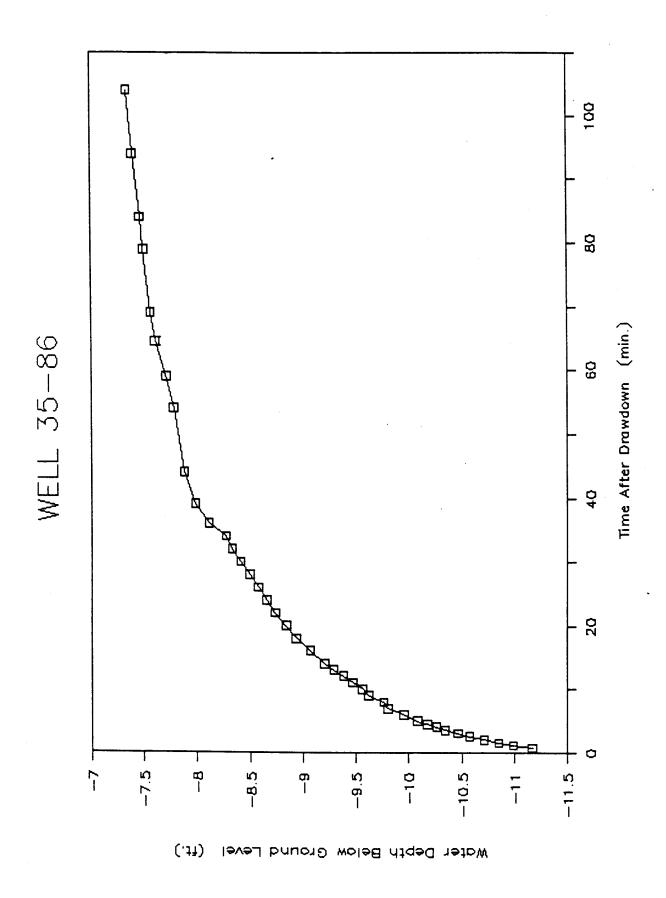
SHEET_	-4
OUEE!	OI

CLIENT/SUBJECT			SHEE!0!
TASK DESCRIPTION			W.O. NO
PREPARED BY	DEDT	DATE	
MATH CHECK BY			APPROVED BY
METHOD REV. BY		DATE	DEPT DATE
	WEL	1 35-86	
T (grd)f	$f(t) = \frac{264}{\Delta s'}$	$Q = \frac{(264)}{17.5}$	<del>(.25)</del> = 3.77
where	Q (gpm)	,= 1.5 gallon	s/c minutes = 0,25gpm
	$\Delta S' = \frac{2}{2} \xi_1 \approx$	nance in residual	drawdown/log succe
	= 17,5	- ft/log cycle (s	ee attached pist)
K (gpd/fe	( <sup>2</sup> ) = T/	b = 3.77	/6.74 = 0.559
wh	ere b (ft)	= 6.741+	
K (cm/s	(ABE) = 0.559	3 Pd/2+2 x. 4.7	9 pd /ft2 = 26 x 10-5
This me	ethod is va	lid where	u_0.01
solvin	ig for t	for u _ c	١٥,٠
t (min) =	rz S HT u	$=\frac{(302)^2}{4(3.77)}$	(.01) × 1440min x 7.482 = al
	= 652 min	•	
where	$f(\hat{x}) = \frac{7,23}{24}$	=) ft = (302	) f +
as' is	? = as	ssumed S f	for confined aguifer





 $(.11) ((d*S)/S^2)$ 



		1	WELL 35-86		
T	T'	Water	S	$s-(s^2/2b)$	log(T/T')
Time	T Prime	Level		b=10.82 ft.	
(min.)	(min.)	(ft.)	(ft.)	(ft.)	
6.75	0.75	11.17	4.23	2.31	0.95
7.10	1.10	10.99	4.05	2.29	0.81
7.50	1.50	10.85	3.91	2.27	0.70
8.00	2.00	10.71	3.77	2.25	0.60
8.50	2.50	10.57	3.63	2.22	0.53
9.00	3.00	10.46	3.52	2.19	0.48
9.50	3.50	10.34	3.40	2.16	0.43
10.00	4.00	10.26	3.32	2.14	0.40
10.50	4.50	10.17	3.23	2.11	0.37
11.00	5.00	10.08	3.14	2.08	0.34
12.00	6.00	9.95	3.01	2.04	0.30
13.00	7.00	9.80	2.86	1.98	0.27
14.00	8.00	9.76	2.82	1.97	0.24
15.00	9.00	9.62	2.68	1.91	0.22
16.00	10.00	9.56	2.62	1.88	0.20
17.00	11.00	9.47	2.53	1.84	0.19
18.00	12.00	9.38	2.44	1.80	0.18
19.00	13.00	9.29	2.35	1.76	0.16
20.00	14.00	9.20	2.26	1.71	0.15
22.00	16.00	9.07	2.13	1.64	0.14
24.00	18.00	8.94	2.00	1.57	0.12
26.00	20.00	8.84	1.90	1.51	0.11
28.00	22.00	8.74	1.80	1.45	0.10
30.00	24.00	8.66	1.72	1.40	0.10
32.00	26.00	8.58	1.64	1.35	0.09
34.00	28.00	8.50	1.56	1.30	0.08
36.00	30.00	8.41	1.47	1.24	0.08
38.00	32.00	8.33	1.39	1.18	0.07
40.00	34.00	8.27	1.33	1.14	0.07
42.00	36.00	8.11	1.17		0.07
45.00	39.00	7.98	1.04		0.06
50.00	44.00	7.88	0.94	0.85	0.06
60.00	54.00	7.78	0.84		0.05
65.00	59.00	7.71	0.77		0.04
70.50	64.50	7.61	0.67		0.04
75.00	69.00	7.57	0.63		0.04
85.00	79.00	7.50	0.56		0.03
90.00	84.00	7.47	0.53		0.03
100.00	94.00	7.40	0.46		0.03
110.00	104.00	7.35	0.41	0.39	0.02

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5			00		18		10+1,2		8.94	2.00			17	
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		345	-	50			10+02		7.98	1.04				<del>- </del>
	_	350	-	2			10+0.19		7.88	0.94		<del></del>	-	-
		355	-	12			10+0,09		7.78				<del></del>	
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2700		Q	CLOCK	t	t'			CONVERSIONS CONRECTIONS		s or s'		READ-	Q	REC		
	2f		1415		74.		5+4.83	2,3/5/4	7.52					WH		
cast	Hear		1420	85	7.9		5+4.81	17	7.50					,		
9			1425	90	84		5+4.78	i.i	7.47	0.53				- 1		
1	3	L	1435		94		5+4.71	/	7.40	0.46				11	90% Recovery	
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# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3586	09/03/86	5909.20	5911.54	2.34	11.60	9.35	5902.19
	09/08/86					9.04	5902.50
	09/09/86					9.14	5902.40
	09/10/86					9.16	5902.38
	09/11/86					9.24	5902.30
	09/12/86					9.29	5902.25
	10/13/86					9.13	5902.41
	11/26/86					9.47	5902.07
	01/01/87					9.38	5902.16
	02/01/87					8.96	5902.58
	03/17/87					6.50	5905.04
	05/08/87					6.00	5905.54
	06/02/87					7.90	5903.64
	07/07/87					6.70	5904.84
	07/27/87					8.10	5903.44
	08/04/87					6.40	5905.14
	09/01/87					8.60	5902.94
	09/29/87					9.00	5902.54
	11/03/87					8.80	5902.74
	12/01/87			•		8.40	5903.14
	12/21/87					8.50	5903.04
	01/11/88				,	8.30	5903.24
	02/29/88					7.10	5904.44
	03/21/88					6.80	5904.74
	04/18/88			<b>F</b>		7.00	5904.54

#### INDEX OF DATA

Boring No.: 36-86								
Completed as well? Yes								
Data in File								
X Log of Borehole								
X Well Construction Summaries								
Well Development Summaries								
Hydraulic Conductivity Test Data and Results								
Packer Test Data and Results								
X Water Level Data								
Saturated Thickness Hydrographs								

Project:

Rocky Flats Plant

# LOG OF BORING NO. 36-86

Date Drilled 8/25/86

Coordinates N 37395.4 E 23715.3

Boring Method Hollow Stem Auger Ground Surface Elevation 5881.94				
Elev. Depth Sample Graphic (feet) Type Log	Material Description	Penetration Resistance (Blows/inch) 20 40		ther ests
	VALLEY FILL ALLUVIUM  0-0.3'-Sample. Recovered 0.3/0.3'=100%. CLAY: moderate yellowish brown (10YR 5/4); silty; poorly sorted; unconsolidated; damp.  0.3-4.3'-Sample. Recovered 2.0/4.0'=50%. CLAY: light brown (5YR 5/6) and dark yellowish brown (10YR 4/2); silty; some granitic cobbles; trace iron concretions; poorly sorted; unconsolidated; damp.  4.3-5.5'-Sample. Recovered 0.9/1.2'=75%. GRAVEL: dark yellowish brown (10YR 4/2); granitic pebbles and cobbles; silty and clayey; trace iron			
- 10 - 15 - 15 - 1	concretions; poorly sorted; unconsolidated; damp.  ARAPAHOE FORMATION  5.5-8.0'-Sample. Recovered 2.5/2.5'=100%. CLAYSTONE: medium light gray (N 6) and light olive gray (5Y 4/1); trace iron staining; weathered; consolidated; moist.  8.0-10.2'-Sample. Recovered 2.2/2.2'=100%. CLAYSTONE: dark yellowish orange (10YR 6/6); some medium light gray (N 6); sandy with 30-40% iron staining; consolidated; moist.			
Remarks Logged by: Project No. 106P06222	total DEPTH: 10.2'  L. Pivonka  Hydro-Search	, Inc.	Checked by:	

WELL	3 <del>6-86</del>	

WELL CONSTRUCTION SUMMARY 5881.94' ELEVATION: GROUND LEVEL -TOP OF CASING \_\_\_ 5883.78' 2 CONSTRUCTION TIME LOG: DRILLING SUMMARY: START FINISH TOTAL DEPTH Well: 6.50' Hole: 10.20' TASK DATE TIME DATE TIME BOREHOLE DIAMETER \_\_ 1986 1986 DRILLING: 8/25 8/25 1520 DRILLER Boyles Brothers Drilling Co. 7년" auger 1014 •4 15865 W. 5th Avenue Golden, CO (Jim Horn) Mobile B-57 RIG . GEOPHYS. LOGGING: T-5 BIT(S) \_ CASING: 8 Pivonka 1523 8/25 1525 2" stainless 8/25 Colden, DRILLING FLUID None SURFACE CASING 5" x 5' steel w/ locking 8/25 1530 8/25 1525 FILTER PLACEMENT 8/25 1533 8/25 1546 CEMENTING: PERSONNEL WELL DESIGN: 8/27 1120 9/3 1055 CEVELOPMENT: BASIS: GEOLOGIC LOG \_X GEOPHYSICAL LOG \_\_ OTHER: 8/25 1533 8/25 1530 Bentonite CASING STRING(S): C = CASING S = SCREEN 8/25 1523 8/25 1520 0.00' 3.50' C1 3.50' - 6.49' SI 10 WELL DEVELOPMENT See Well Development Summary Sheet. -12 CASING: C1 2" I.D. Sch. 5 type 316 stainless steel, threaded and flush Rocky Flats Plant iointed. SCREEN: SI 2" I.D. Sch. 5 type 316 stain--14 106P06222 less steel, threaded and flush **COMMENTS:** jointed, 0.010" wire wrap screen No water encountered during drilling. 0.25' welded bottom cap. CENTRALIZERS Type 304 stainless steel Top of stainless steel casing: 1.84' 4.42' - 5.59' \_16 PROJECT FILTER MATERIAL 32-42 silica sand 2.50' - 7.00' CEMENT Portland Type I 0.00' - 2.00' - 18 OTHER 3/8" bentonite pellets

HYDRO-SEARCH RENO-DENVER

2.00' - 2.50' 7.00' - 10.20'

20

CONSULTING HYDROLOGISTS-GEOLOGISTS

### ROCKY FLATS SOLAR PONDS

### WATER LEVEL SUMMARY

WELL		GROUND SURFACE	TOP OF CASING	STICK	DEPTH OF SI	WATER DEPTH	WATER SURFACE
NUMBER	DATE	ELEVATION	ELEVATION	UP	BASE	BELOW_TOC	ELEVATION
3686	08/27/86	5881.94	5883.78	1.84	6.49	9.28	5874.50
	09/03/86			,,,	••••	-1.00	DRY
	10/13/86					-1.00	DRY
	11/26/86					-1.00	DRY
	01/01/87					7.02	5876.76
	02/01/87					6.17	5877.61
	05/06/87					6.08	5877.70
	06/01/87					5.83	5877.95
	07/08/87					5.65	5878.13
	07/27/87					5.80	5877.98
	08/04/87					7.00	5876.78
	09/01/87					5.80	5877.98
	09/28/87					7.60	5876.18
	11/03/87					7.70	5876.08
	12/01/87					7.65	5876.13
	12/08/87					7.30	5876.48
	01/07/88					7.50	5876.28
	02/24/88					7.40	5876.38
	03/14/88					7.30	5876.48
	04/11/88	•				5.80	5877.98

APPENDIX B-2
1987 MONITOR WELLS

### INDEX OF DATA

Boring No.: 21-87							
Completed as well? Yes							
Data in File							
X Log of Borehole							
X Well Construction Summaries							
X Well Development Summaries							
Hydraulic Conductivity Test Data and Results							
Packer Test Data and Results							
X Water Level Data							
Saturated Thickness Hydrographs							

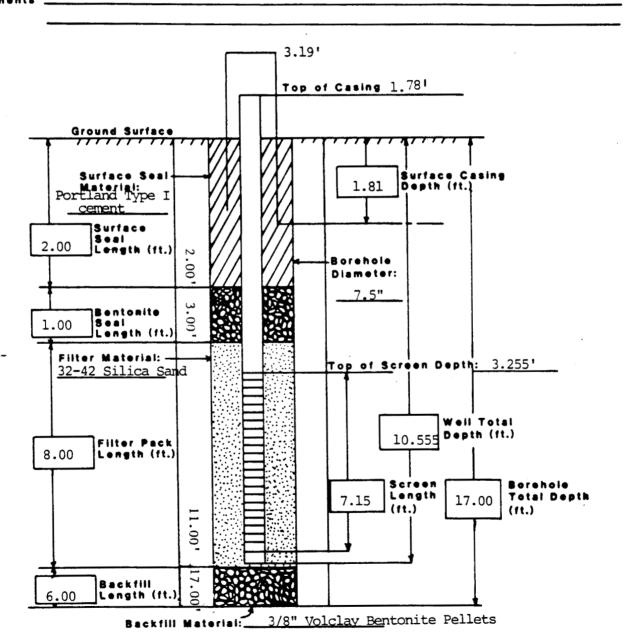
Coordinates Total Depth Drilling Compa	N 36980.2  17.00'  Poyle October 16  Hollow K. D. Holl Geo	es Bros , 1987 Stem Auger	Water Level E	Elevation 5927.58' Encountered 7.0' Static Dry harp erritt None
		Lithologic D	escription	Samples Collected or Other Tests Performe
10			yellowish brown (10 rellowish brown (10 cobbles, broken to very fine-grained; soldiated; grass and to HCl; damp.  60%. as above; damp.  10%. ay (5 Y 5/2); broken ce very fine-grained damp.  100%. olive gray (5 Y 5/2); ed quartzite pebbles; ned sand; some iron st. AY: dusky yellowish b; very fine-grained	2.0-4.0': Readings on core: HNu = 200; OVA = 3.6.  7.0-9.5': Readings on core: HNu = 5.0; OVA = 3.8.
20	+ +	•		

Location Rocky	Flats Plant: Mound Area	Borehole/Well	No. <u>21-87</u>
Coordinates N	36980.21 E 22693.84	Ground Surfac	• Elevation 5927.58'
Total Depth17	7.00		Encountered 7.0'
			Static Dry
Drilling Company	Boyles Bros	Driller _R. St	narp
Date Drilled Oct		Helper T. Me	erritt
Drilling Method	Hollow Stem Auger	Drilling Fluid	None
Logged By K.	D. Holliway	Checked By	
	Geologist		Site Manager
		-	CEARP Manager
Comments			
	Litholog	ic Description	Samples Collected or Other Tests Performed
	(5 Y 5/2); occ rounded quartzing grained sand; to moist.  ARAPAHO  10.4-12.0': SAND olive gray (5 Y 5/0) with dark y 6/6) iron staining trace caliche; dan  12.0-14.5' SAMPL Recovered 2.5/2.5	= 100%.  CLAY: light olive gray asional subrounded to the pebbles; very fine-race caliche; damp to  DE FORMATION  Y CLAYSTONE: light 5/2) to medium gray (Nellowish orange (10 YR); very fine-grained sand; inp to moist.  E.	
- + - + - +	trace dark yellov	ive gray (5 Y 4/1) with vish orange (10 YR 6/6) some very fine-grained a above; trace caliche;	

### WELL COMPLETION INFORMATION

Location Rocky Flats Plant: Mound Area Well No. 21-87 Coordinates N 36980.21 E 22693.84 Elevation: Ground Surface 5927.58' Total Depth: Well \_\_\_10.555' Top of Casing \_\_5929.36' Borehole 17.00' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, type 316 TFJ stainless. Casing Diameter \_\_2" ID Screen Material 0.010" wire wrap, type 316 TFJ

Data leatelled Oct 16 1987 stainless steel Surface Casing Diameter 5" ID Date installed Oct. 16, 1987 Approved By \_ Installed By K. D. Holliway
Geologist Site Manager CEARP Manager Comments



Well No.: 21-87

# WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87		Pumping		Sandy	Water level 7.63' after pumping
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# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2187	11/12/87 12/01/87 12/22/87 01/27/88 02/29/88 03/21/88 04/18/88	5927.58	5929.36	1.78	10.40	7.30 -1.00 7.20 7.40 7.10 8.40 7.80	5922.06 DRY 5922.16 5921.96 5922.26 5920.96 5921.56

### INDEX OF DATA

Boring No.: 22-87BR					
Completed as well? Yes					
Data in File					
X Log of Borehole					
X Well Construction Summaries					
X Well Development Summaries					
Hydraulic Conductivity Test Data and Results					
X Packer Test Data and Results					
X Water Level Data					
Saturated Thickness Hydrographs					

Location Rocky Flats Plant: Mound Area Coordinates N 36934.99 E 22715.72 Total Depth \_110.40'

Drilling Company Boyles Bros Date Drilled Sept 30 & Oct 7-8, 1987 Drilling Method Hollow Stem Auger; Rotary Core Logged By K.D. Holliway; J.B. Bergman Geologist

Borehole/Well No. 22-87BR Ground Surface Elevation 5930.70' Water Level Encountered 12.2' Static 5852.04' (12/01/87) Driller R. Sharp Helper T. Merritt Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Water

CEARP Manager er 2. 1987

Site Manager

C

0	Lithologic Description	Samples Collected Other Tests Perfor
	COLLUVIUM	HNu Background=0.6 OVA Background=1.2
	0.0-2.0' SAMPLE, Recovered 2.0/2.0' = 100%, CLAYEY SAND: moderate yellowish brown (10 YR 4/2) to dusky yellowish brown (10 YR 2/2); subrounded to suban-	0-2.0': Readings on core: HNu = 1.0; OVA = 4.0.
<u>5</u>	gular quartzite cobbles and pebbles; sand fine-grained to coarse-grained; poorly sorted; calcareous; unconsolidated; some caliche; dry.	2.0-4.0°: Readings on core: HNu = 4.0; OVA = 1.2.
	2.0-4.0' SAMPLE.  Recovered 1.5/2.0' = 75%.  CLAYEY SAND: same as above; dry.  4.0-6.0' SAMPLE.  Recovered 2.0/2.0' = 100%.	4.0-6.0': Readings on core: HNu = Background; OVA = 1.6.
<u>α</u> .	CLAY: light olive gray (5 Y 5/2) to dusky yellowish brown (10 YR 2/2); trace subrounded quartzite cobbles; trace very fine-grained sand; trace caliche; damp.	6.0-8.0': Readings on core: HNu = 1.2; OVA = 10.
<u>5</u>	6.0-8.0' SAMPLE.  Recovered 2.0/2.0' = 100%.  CLAY: same as above except with dark yellowish orange (10 YR 6/6) iron staining and stringers of brownish gray (5 YR 4/1) claystone; damp.	8.0': Readings in augers: OVA = 100.0; HNu = 1.2.  8.0-10.2': Readings in
	8.0-10.2' SAMPLE. Recovered 2.2/2.2' = 100%. CLAY: light olive brown (5 Y 5/6) to light olive gray (5 Y 5/2); some iron staining; some sand; trace caliche; damp.	core: HNu = Back- ground; OVA = 2.0.  10.2-12.2': Readings on core: HNu = 2.0; OVA = 20.

Coordinates N 36934.99 E 22715.72
Total Depth 110.40'

Drilling Company Boyles Bros

Date Drilled Sept 30 & Oct 7-8, 1987

Drilling Method Hollow Stem Auger; Rotary Core
Logged By K.D. Holliway; J.B. Bergman

Geologist

Borehole/Well No. 22-87BR

Ground Surface Elevation 5930.70'

Water Level Encountered 12.2'

Static 5852.04' (12/01/87)

Oriller R. Sharp

Helper T. Merritt

Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Water

Checked By Site Manager

CEARP Manager

Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987

	Lithologic Description	Samples Collected or Other Tests Performed
	10.2-12.2' SAMPLE.  Recovered 2.0/2.0' = 100%.  CLAY: light olive gray (5 Y 5/2); some very fine-grained sand stained dark yellowish orange (10 YR 6/6); subrounded quartzite cobbles; some iron staining; trace caliche; damp.	12.2-26.5': No readings above background on the core.
<u>25</u>	12.2-14.2' SAMPLE. Recovered 2.0/2.0' = 100%. 12.2-12.8': SANDY CLAY: same as above; moist to wet.	26.5-27.5': Readings on core: HNu = Back- ground; OVA = 1.6.
<u>30</u>	ARAPAHOE FORMATION  12.8-14.2': SANDY CLAYSTONE: same as above except no quartzite cobbles; moist to wet.	28.5-29.5': Readings on core: HNu = 2.0; OVA = 1.0.
	14.2-16.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: light olive gray (5 Y 5/2); some very fine-grained sand; some dusky yellow (5 Y 6/4); trace caliche; damp to moist.	
<u>35</u>	16.2-18.2' SAMPLE: Recovered 2.0/2.0' = 100%. CLAYSTONE: olive gray (5 Y 4/1); occasional dark yellowish orange (10 YR 6/6) iron staining; trace very fine-grained sand; trace caliche; damp.	
40	18.2-20.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above; damp.	

Borehole/Well No. 22-87BR Location Rocky Flats Plant: Mound Area Ground Surface Elevation 5930.701 E 22715.72 N 36934.99 Coordinates Total Depth \_\_110.40' Water Level Encountered \_\_12.2' Static 5852.04' (12/01/87) Drilling Company Boyles Bros Driller R. Sharp Date Drilled Sept 30 & Oct 7-8, 1987 Helper T. Merritt 0.0 - 45.1' None; Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid 45.1' - 110.4' Water Logged By K.D. Holliway; J.B. Bergman Checked By Site Manager Geologist CEARP Manager Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987 Samples Collected or Lithologic Description 20.2-22.2' SAMPLE. Recovered 2.0/2.0' = 100%. CLAYSTONE: same as above; damp. Hole readjusted to 22.50'. 22.5-23.5' SAMPLE, Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above except light <u>45</u> 45.60-52.55": Packer olive gray (5 Y 5/2) with trace dark yellowish orange (10 YR 6/6) iron staining; Test Interval #7. no caliche; dry. 23.5-24.5' SAMPLE. Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above except no iron staining; homogenous; dry to slightly damp. <u>50</u> 24.5-25.5' SAMPLE, Recovered 1.4/1.0' = 140%. CLAYSTONE: same as above; dry to 52.55-62.20': Packer slightly damp. Test Interval #6. 25.5-26.5' SAMPLE, Recovered 1.4/1.0' = 140%. CLAYSTONE: light olive gray (5 Y 5/2) with trace dark yellowish orange (10 YR 55 6/6) iron staining in small fractures; trace very fine-grained sand; trace silt; damp to dry. 26.5-27.5' SAMPLE. Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above; damp.

60

Location R	ocky Flat	s Plant: Mound Area	Borehole/Well	No. <u>22-87BR</u>	
		34.99 E 22715.72	Ground Surface	Elevation 5930.70'	
Total Depti				ncountered 12.2'	
, oter orpic				Static 5852.04' (12/01/8)	<u> </u>
Drilling Cor	BC	ovles Bros	Driller R. Sh		_
		% Oct 7-8, 1987	Helper T. Me		_
					_
Drilling Met	thod DOIL	Low Stem Auger; Rotary Cor		45.1' - 110.4' Water	_
Logged By		lliway: J.B. Beroman	Checked By	Site Manager	_
	•	300.09181			
			_	CEARP Manager	
Comments	Surface	casing set to 43.59' by K	.D. Holliway on	October 2, 1987	_
					_
	7.	7. /			
/3				Samples Collected or	r .
/04		E Q Lithologic Des	cription	Other Tests Performe	0
60	/ 6 / 4	· /			
		27.5-28.5' SAMPLE.			
		+ Recovered 1.5/1.0' = 150°			
		CLAYSTONE: same as	above; damp to		
		† moist.		62.20-71.85': Packer	
	三五	28.5-29.5' SAMPLE.		Test Interval #5.	
		Recovered 1.5/1.0' = 150'	0 <del>/</del> 0	.	
		CLAYSTONE: same as a		1	
<u>65</u>		iron staining; damp.			
0.1		1			
		29.5-30.5' SAMPLE.		1	
		Recovered $1.5/1.0' = 150'$			
		CLAYSTONE: same as a ics; damp.	bove; trace organ-	1	
		ics, damp.			
		30.5-31.5' SAMPLE,		_	
		Recovered $1.5/1.0' = 150$	%.		
70		SANDY CLAYSTONE: 1			
<u>70</u>		Y 5/2) with dark yell	•		
		YR 6/6) iron staining a		71.85-81.50': Packer	
		(10 YR 7/4) very fineded sands; occasional		Test Interval #4.	
		some silt; some organics;		1	
		Same of Barress,		1	
		† 31.5-32.5' SAMPLE.		1	
		$\int \text{Recovered } 1.0/1.0' = 100$		1	
		SANDY CLAYSTONE:		1	
75		2/1) to light olive a			
		limonite nodules and in erate brown (5 YR 4/4);	very fine-grained	1	
		interbedded sands, gray	ish orange (10 YR		
	三	+ 7/4); some silt; trace org			
			• • •		
		+			
				1	
		†			
_80					
<del></del>				Page4 of11	

Borehole/Well No. 22-87BR Location Rocky Flats Plant: Mound Area Ground Surface Elevation 5930.70' Coordinates N 36934.99 E 22715.72 12.2' Water Level Encountered \_ 110.40' Total Depth Static 5852.04' (12/01/87) Drilling Company Boyles Bros Oriller R. Sharp Date Drilled Sept 30 & Oct 7-8, 1987 Helper T. Merritt 0.0 - 45.1' None; Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid 45.1' - 110.4' Water Logged By K.D. Holliway; J.B. Bergman Checked By . Site Manager Geologist CEARP Manager Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987 (Greate) # 5° mo! Samples Collected or Other Tests Performed Lithologic Description 81.50-91.15': Packer 32.5-33.5' SAMPLE. Test Interval #3. Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above except no 82.70-92.35': Packer interbedded sands; no nodules; less sand; Test Interval #2. dry. 33.5-34.5' SAMPLE. Recovered 1.5/1.0' = 150%. 85 CLAYSTONE: light olive gray (5 Y 5/2) to olive black (5 Y 2/1) with some moderate yellowish brown iron staining (10 YR 5/4); some very fine-grained sand; some silt; some organics; brittle; dry. 34,5-35.5' SAMPLE. Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above; dry. 90 35.5-36.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: olive black (5 Y 2/1) to grayish black (N 2/0); some very fine-92.35-102.0': Packer grained sand; some silt; some organics; Test Interval #1. trace limonite nodules; dry. Weathered/ unweathered contact = 36.0'. 36.5-37.5' SAMPLE. 95 Recovered 2.0/1.0' = 200%. CLAYSTONE: olive black (5 Y 2/1); some very fine-grained sand in fractures with dark yellowish orange (10 YR 6/6) iron staining; some organics; dry to slightly damp.

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100

Borehole, Well No. 22-87BR Location Rocky Flats Plant: Mound Area Ground Surface Elevation 5930.70 Coordinates N 36934.99 E 22715.72 Total Depth 110.40' Water Level Encountered \_\_12.2' Static 5852.04' (12/01/87) Drilling Company Boyles Bros Driller R. Sharp Date Drilled Sept 30 & Oct 7-8, 1987 Helper T. Merritt 0.0 - 45.1' None: Drilling Method Hollow Stem Auger; Rotary Core Drilling Fluid 45.1' - 110.4' Water Logged By K.D. Holliway; J.B. Bergman Checked By Site Manager Geologist CEARP Manager Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1987 Samples Collected or Lithologic Description Other Tests Performed 37.5-38.5' SAMPLE. Recovered 1.0/1.0' = 100%. CLAYSTONE: same as above with more sands; dry. 38.5-39.5' SAMPLE. Recovered 1.3/1.0' = 130%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); some very fine-grained 105 sand with moderate yellowish brown (10 YR 5/4) staining; some silt; some organics; dry. 39.5-40.5' SAMPLE. Recovered 1.2/1.0' = 120%. CLAYSTONE: same as above with less sands and less iron staining; dry. 110 40.5-41.5' SAMPLE. Recovered 1.2/1.0' = 120%. CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); very fine-grained calcareous sand in fractures with moderate yellowish brown (10 YR 5/4) staining; at 41.2' band of caliche (or calcareous sand) reacts strongly with HCl; some organics; 115 41.5-42.5' SAMPLE. Recovered 1.5/1.0' = 150%. CLAYSTONE: same as above; dry. 42.5-43.5' SAMPLE, Recovered  $1.4/1.0^{\circ} = 140\%$ . CLAYSTONE: same as above; dry.

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Location Rocky Flats Plant: Mound Area Borehole/Well No. 22-87BR Coordinates <u>N 36934.99</u> E 22715.72 Ground Surface Elevation 5930.70' Total Depth 110.40 Water Level Encountered 12.2' Static 5852.04' (12/01/87) Drilling Company Boyles Bros Oriller R. Sharp Date Drilled Sept 30 & Oct 7-8, 1987 Helper T. Merritt Drilling Fluid 0.0 - 45.1' None; 45.1' - 110.4' Water Drilling Method Hollow Stem Auger; Rotary Core Logged By K.D. Holliway; J.B. Bergman Site Manager Geologist CEARP Manager Comments Surface casing set to 43.59' by K.D. Holliway on October 2, 1927 ,00 Samples Collected or Lithologic Description Other Tests Performed 45.1-49.50' SAMPLE. Recovered 3.7/4.5' = 82%. RQD = 2.6/3.7' = 70%. 45.1-45.6': CLAYSTONE: dark greenish gray (5 GY 4/1); dense; very broken; probably slough. 45.6-47.4': SANDSTONE: dark greenish gray (5 GY 4/1); fine-grained; well sorted; some moderate brown (5 YR 4/4) iron stains; trace organics; fracture (-80°) at 46.5-46.7' filled with iron stains; moist. 47.4-49.5': CLAYSTONE: dark greenish gray (5 GY 4/1); dense; no stains; homogenous; dry to moist. 49.5-52.5' SAMPLE Recovered 2.7/3.0' = 90%. RQD = 1.2/2.7' = 44%.CLAYSTONE: olive gray (5 Y 3/2); no silt; no sand; homogenous; trace organic fragments; consolidated; moist. 52.5-56.5' SAMPLE. Recovered  $3.9/4.0^{\circ} = 98\%$ . RQD = 3.9/3.9' = 100%.CLAYSTONE: same as above; moist. 56.5-60.5' SAMPLE. Recovered 3.8/4.0' = 95%. RQD = 1.3/3.8' = 34%.CLAYSTONE: dark gray (N 3/0) to grayish black (N 2/0); dense; homogenous; some carbonaceous debris; moist to wet.

of ...

Location Ro	ocky Flats Plant: Mound Area	Borehole/Well	No. 22-87BR
Coordinates	04004 00 = 00715 70		• Elevation 5930.70'
Total Depth			Encountered 12.2!
, , , , , , , , , , , , , , , , , , , ,			Static 5852.04' (12/01/87)
Drilling Com	pany Boyles Bros	Driller R. Sh	arp
	Sept 30 & Oct 7-8, 1987	Helper T. Me	
	hod Hollow Stem Auger; Rotary Core		0.0 - 45.1' None;
•	K.D. Holliway; J.B. Bergman	_	45.1' - 110.4' Water
204404 07	Geologist Geologist	Checked By	Site Manager
		-	CEARP Manager
Comments	Surface casing set to 43.59' by K.	D. Holliway on	October 2, 1987
Commonce			
/5			Samples Collected or
200	Lithologic Desc	ription	Other Tests Performed
/ 9 4	Lithologic Desc	•	
	$\frac{60.5-64.5' \text{ SAMPLE.}}{\text{Recovered } 3.6/4.0' = 90\%.}$		
	RQD = 3.6/3.6' = 100%.		
	CLAYSTONE: dark gray	(N 3/0): dense:	
	consolidated; homogenous	some carbona-	
-	ceous debris; sandy from		
	to wet.		
-			
	64.5-68.5' SAMPLE.		
	Recovered $3.3/4.0' = 83\%$ . RQD = 2.1/3.3' = 64%.		
•	64.5-66.6': CLAYSTONE: s	ame as above	
_	66.6-67.8': MUDSTONE: b		
	YR 4/1); very fine-graine	d; "sulphur-like"	
	smell when HCl is added		
	bonaceous fragments; fra	gments strongly	
-	react with HCl; cement of acts when powdered;	only slightly re-	
	dense; dry.	very nard and	
	68.5-72.5' SAMPLE.		
	Recovered 4.0/4.0' = 100% RQD = 3.7/4.0' = 93%.	) <b>.</b>	
•	CLAYSTONE: brownish t	lack (5 YR 2/1)	
,	trace very fine-grained		
	organic fragments; moist	•	
	+ + +		
	72.5-76.5' SAMPLE.		
-	Recovered $3.7/4.0' = 93\%$ .		
	RQD = $3.7/3.7' = 100\%$ . CLAYSTONE: same as	ahove no sand.	
	fractures at 76.0' and 76		
	to wet.	( /,	
	1 1 1		
	+ + +		
			1

Location Rocky Flats Plant; Moun	d Area Bozahola/Wa	II No. 22-87BR
Coordinates N 36934.99 E 227	15.72 Ground Surte	ice Elevation 5930.70'
Total Depth 110.40'		Encountered 12.2'
70(a) Depth		Static 5852.04' (12/01/87)
Drilling Company Boyles Bros	Driller R.	
Date Drilled Sept 30 & Oct 7-8, ]		
Drilling Method Hollow Stem Auger		
	Occurrence of the second	0.0 - 45.1' None; 45.1' - 110.4' Water
Logged By K.D. Holliway; J.B. I	Geroman Checked By	Site Manager
•		
Comments Surface casing set to	a 43 59' by K.D. Holliway o	on October 2, 1987
Comments Surface Cashin Set a	5 45.55 By R.B. Holling	
/s /s /s /		
	ithologic Description	Samples Collected or Other Tests Performed
		/ <b>C</b> t <b>C</b> t.   <b>C C</b> t.   <b>C C C C C C C C C C</b>
76.5-80.5' S		
	$4.0/4.0^{\circ} = 100\%.$ $/4.0^{\circ} = 90\%.$	1
	NE: same as above.	
+ + + TOTAL D	EPTH OF HOLE: 78.50'; AD	)-
JUST DEP	TH.	
T T T 70 5 00 516	A A SERVICE	i i
	3.7/4.0' = 93%.	
	$\frac{3.7}{4.0} = \frac{93}{100}$	1
	CLAYSTONE: same as above.	
81.5-82.5':	SANDSTONE: medium gray ()	N
	l sorted; fine to very fine	
	ounded; some silt; some organ	1-
ics; consol	idated; homogenous; moist.	•
- † † † <u>82,5-86,5'</u>	SAMPI F	
	14.0/4.0' = 100%.	1
	$0/4.0^{\circ} = 75\%$ .	
	ONE: medium gray (N 5/0); fir	
	n-grained; rounded; well sorte	
	ted; calcareous cementation fro strongly reacts with HCl; son	
	strongly reacts with HCl; son rs <1" thick present throughou	
wet to mo		,
† † †		
_		
† † †		[
1 1 1		
+ + +		1
† † †		-
		, 1

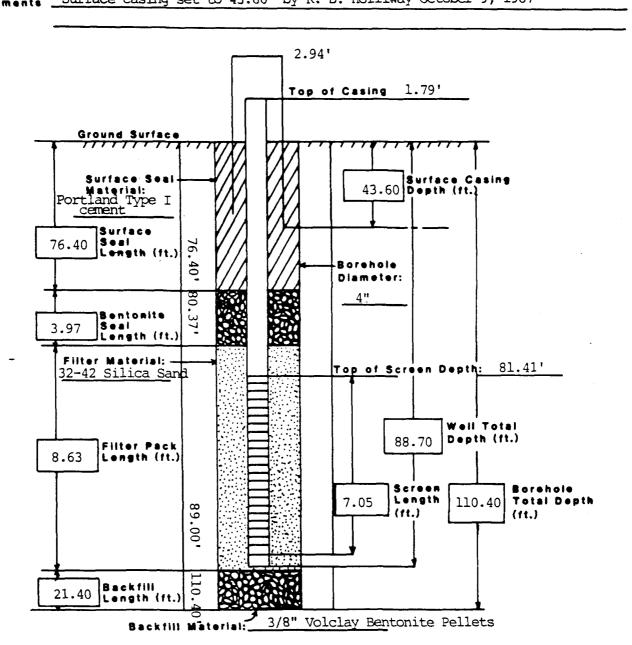
Rits Plant: Mound Area  934.99 E 22715.72  ROYLES Bros  80 & Oct 7-8, 1987  Llow Stem Auger; Rotary Core  Colliway: J.B. Bergman  Geologist	Ground Surface Water Level  Driller R. St Helper T. Me	
/*./		CEARP Manager October 2, 1987  Samples Collected or Other Tests Performed
86.5-90.5' SAMPLE. Recovered 2.6/4.0' = 65%. RQD = 1.3/2.6' = 50%. 86.5-87.1': SANDSTONE: gray (N 6/0); fine to rounded; well sorted; ca very dense and consolidat 87.1-88.5': INTERBEDDE AND CLAYSTONE: si medium gray (N 5/0); claystone layers medium 4/0); consolidated; moist. 88.5-89.1': CLAYSTONE gray (N 4/0) with some	medium light medium-grained; lcareous cement; ted; dry. D SANDSTONE andstone layers 0.5" to 2" thick; dark gray (N : medium dark very thin (<0.5')	
STONE: medium light gr stone and medium dar claystone; sandstone layer claystone layers 0.2-0.5'	ay (N 6/0) sand- k gray (N 4/0) rs .05 to 1' thick; thick; decrease	
	80 & Oct 7-8, 1987 Lithologic Descriptions  86.5-90.5' SAMPLE. Recovered 2.6/4.0' = 65%. RQD = 1.3/2.6' = 50%. 86.5-87.1': SANDSTONE: gray (N 6/0); fine to rounded; well sorted; ca very dense and consolidated; with some sandstone layers medium 4/0); consolidated; moist. 88.5-89.1': CLAYSTONE gray (N 4/0) with some sandstone layers; same moist.  90.5-95.0' SAMPLE. Recovered 4.0/4.5' = 89%. RQD = 3.3/4.0' = 83%. INTERBEDDED SAND: STONE: medium light gray stone and medium dar claystone; sandstone layers old and claystone; sandstone layers old and claystone; sandstone layers old and claystone; sandstone layers old and sandstone content with	Ground Surface  Water Level  Soyles Bros  Store Cot 7-8, 1987  Llow Stem Auger; Rotary Core  Casing set to 43.59' by K.D. Holliway on  Be casing set to 43.59' by K.D. Holliway on  Checked By  Checked By  Lithologic Description  Scalar Secured 2.6/4.0' = 65%.  RQD = 1.3/2.6' = 50%.  RQD = 1.3/2.6' = 50%.  ROD = 3.3/4.0' = 80%.  ROD = 3.3/4.0'

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Logged By K.D. Holli	es Bros Oct 7-8, 1987 Stem Auger; Rotary Core Oct 7-8, 1987 Oct 7-8, 1987 Oct 7-8, 1987	Static   Second   S
Comments Surface ca	Lithologie Description	Samples Collected or Other Tests Performed
	95.0-99.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 2.8/4.0' = 70%. INTERBEDDED SANDSTONE/ STONE: same as above with c layer from 97.3-98.7'; moist to wet.  99.0-103.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 1.3/2.0' = 65%. INTERBEDDED SANDSTONE/ STONE: same as above with le content; layers are not distinct changes; moist to wet.  102.0-107.0' SAMPLE. Recovered 5.0/5.0' = 100%. RQD = 5.0/5.0' = 100%.	CLAY-ess sand
	CLAYSTONE: medium dark gray trace silt; trace carbonaceous fr homogenous; consolidated; dense (picked up one foot of core frun).  107.0-111.0' SAMPLE. Recovered 2.0/4.0' = 50%. RQD = 0.0/2.0' = 0%. CLAYSTONE: same as above; v ken; moist.  TOTAL DEPTH: 110.40'	ragments; se; moist rom last

### WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Mound Area 22-87BR Well No. Coordinates N 36934.99 E 22715.72 Elevation: Ground Surface 5930.70' Total Depth: Well 88.70' Borehole 110.40' Formation of Completion Arapahoe Formation Casing Material Sch 5, type 316 TFJ stainless steel Casing Diameter \_\_\_ Screen Material 0.010" wire wrap, type 316 TFJ Surface Casing Diameter 5" ID Date Installed Oct. 10, 1987 Approved By installed By K. D. Holliway Site Manager Geologist CEARP Manager Commente Surface casing set to 43.60' by K. D. Holliway October 9, 1987



Well No.: 22-87BR

# WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/2/87		Pumping		Sandy	Water level 22.15' after pumping
-					
414					

# PACKER TEST DATA SHEET

Job No.: 2029-17-02

Static Water Level: 78.661.

Location: Rocky Flats Plant; Mound Area

Date of Water Level: 12/1/87\_

Well No.: 22-87BR

Page 1 of 2

Borehole Diameter: 0.333' Comments: Test in pressu

Comments: Test interval #5 failed on 2/3 pressure test and second 1/3 pressure test due to water gain in acrylic tube and test

Acrylic Tube Diameter: 0,1663'

intervals #6 and 7 failed on second 1/3 pressure test.

_				_				,						,		,				
	Geologist	JBB	JBB	JBB	JBB	JBB	JBB	JBB	JBB	JBB	JBB	JBB	JBB	КДН	КДН	KDH	KDH	KDH	КДН	
	Librategy	Kass	Kass	Kass	Kass	Kass	Kass	Kass	Kass	Kass	KCL	KCL	KCL	KCL	KCL	KCL	KCL	KCL	KCL	
	Date of Test	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/09/87	10/12/87	10/12/87	10/12/87	10/12/87	10/12/87	10/12/87	
	Δħ	0.88	1.66	0.59	2.93	3.88	2.56	2.67	4.43	1.90	0.03	0.15	00.0	0.01	-0.03	-0.37	0.05	0.12	-0.11	
	Gage Helght • Avg. H2O Helght	10.95	7.50	10.20	9.62	7.50	10.45	11.12	7.50	9.44	11.88	7.50	12.87	11.61	02.9	11.11	12.05	6.70	8.22	
	Ave. H <sub>2</sub> O Height	3.45	N/A	2.70	2.12	N/A	2.95	3.62	N/A	1.94	4.38	N/A	5.37	4.91	N/A	4.41	5.35	N/A	1.52	
	Gage Height	7.50	7.50	7.50	7.50	7.50	7.50	7,50	7.50	7.50	7.50	7.50	7.50	6.70	6.70	6.70	6.70	6.70	6.70	
	Gege Preseure	0	18.5	0	0	16.5	0	0	16.05	0	0	13.5	0	0	11.8	0	0	9.5	0	
	Test Length (minutes)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
	Bottom of Test Interval	102.00			92.35			91,15			81.50			71.85	·		62.20			
	Top of Test Interval	92.35			82.70			81.50			71.85			62.20			52.55			
	Teet Interval No.				2			3			7			5			9			

			-	PACK	PACKER TEST	DATA SHEET	HEET				
Job No.:	2029-17-02 Rocky Flat	Job No.: 2029-17-02 Location: Rocky Flats Area; Mound Area	ound Area						Static Wa	Static Water Level: 78.66' Date of Water Level: 12/1/87	78.66'
Well No.:	22-87	22-87BR (CON'T)		ပိ 	Commente				Page 2	of 2	-
Borehole Acrylic To	Borehole Diameter: Acrylic Tube Diameter:	0.333' Br: 0.1663'		; 							
Test Interval No.	Top of Test Interval	Bottom of Teet Interval	Test Length (minutes)	Cage Preseurs	Gege Height	Ave. H <sub>2</sub> 0 Height	Gage Height +Avg. H2O Height	40	Date of Tea	LiBratogy	Geologiet
7	45.60	52.55	15	0	6.70	4.45	11.15	90.0	10/12/87	KCL	KDH
			15	8.0	6.70	N/A	6.70	0.15	10/12/87	KCL	КДН
			15	0	6.70	2.86	9.56	-0.44	1012/87	KCL	KDH
					,						
							٠				
				-							

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## PACKER TEST ANALYSIS WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 45.60 - 52.55
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00008688 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 6.95 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 49.07 + 11.15 + .00 \* 2.31 = 60.22
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001233 FT/MIN K = .00000006 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00021721 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 6.95 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 49.07 + 6.70 + 8.00 \* 2.31 = 74.25
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000002500 FT/MIN K = .00000013 CM/SEC

2ND P1/3 TEST

TEST ABORTED

# PACKER TEST ANALYSIS WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA

DATE TESTED: 10/12/87

TEST INTERVAL (FEET BELOW G.S.): 52.55 - 62.20

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

 $K = \frac{Q}{2(PI)(L)(H)} LN(--)$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)

= 57.38 + 12.05 + .00 \* 2.31 = 69.43

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000698 FT/MIN K = .00000004 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 57.38 + 6.70 + 9.50 \* 2.31 = 86.02
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001353 FT/MIN K = .00000007 CM/SEC

2ND P1/3 TEST

TEST ABORTED

### PACKER TEST ANALYSIS WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02 DATE TESTED: 10/12/87 BY: K.D. HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 62.20 - 71.85

MATERIAL TESTED: ARAPAHOE CLAYSTONE

DEPTH TO WATER (FEET BELOW G.S.): 78.66

K = ----- LN(--)2(PI)(L)(H)

1ST P1/3 TEST

Q = INJECTION RATE = .00001448 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 67.03 + 11.61 + .00 \* 2.31 = 78.64

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000123 FT/MIN

K = .00000001 CM/SEC

P2/3 TEST

TEST ABORTED

2ND P1/3 TEST

TEST ABORTED

# PACKER TEST ANALYSIS WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02
DATE TESTED: 10/09/87 BY: J.B. BERGMAN
TEST INTERVAL (FEET BELOW G.S.): 71.85 - 81.50

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

 $K = \frac{Q}{2(PI)(L)(H)} LN(--)$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEDMY OF CENTER OF INTERVAL + GAGE HE

= 76.68 + 11.88 + .00 \* 2.31 = 88.56 R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000000328 FT/MIN<math>K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00021721 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 76.68 + 7.50 + 13.50 \* 2.31 = 115.36

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .0000001261 FT/MIN
K = .00000006 CM/SEC

2ND P1/3 TEST TEST ABORTED

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PACKER TEST ANALYSIS
WELL NO. 22-87BR
```

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02

DATE TESTED: 10/09/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 81.50 - 91.15

MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

 $K = - \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00386629 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 11.12 + .00 \* 2.31 = 89.78

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000288 FT/MIN

K = .00000146 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00641485 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 7.50 + 16.05 \* 2.31 = 123.24

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000349 FT/MIN

K = .00000177 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00275129 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 9.44 + .00 \* 2.31 = 88.10

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000209 FT/MIN

K = .00000106 CM/SEC

# PACKER TEST ANALYSIS WELL NO. 22-87BR

ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02

DATE TESTED: 10/09/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 82.70 - 92.35

MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 78.66

,

K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00424278 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 9.62 + .00 \* 2.31 = 88.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000322 FT/MIN

K = .00000163 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00561843 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 7.50 + 16.50 \* 2.31 = 124.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000303 FT/MIN

K = .00000154 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00370700 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 10.45 + .00 \* 2.31 = 89.11

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000279 FT/MIN

K = .00000141 CM/SEC

```
PACKER TEST ANALYSIS
WELL NO. 22-87BR
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ROCKY FLATS PLANT; MOUND AREA JOB NO. 2029-17-02

DATE TESTED: 10/09/87 BY: J.B. BERGMAN

TEST INTERVAL (FEET BELOW G.S.): 92.35 - 102.00

MATERIAL TESTED: ARAPAHOE SANDSTONE

DEPTH TO WATER (FEET BELOW G.S.): 78.66

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00127428 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 10.95 + .00 \* 2.31 = 89.61

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000095 FT/MIN

K = .00000048 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00240376 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 7.50 + 18.50 \* 2.31 = 128.90

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000125 FT/MIN

K = .00000063 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00085435 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 78.66 + 10.20 + .00 \* 2.31 = 88.86

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000064 FT/MIN

K = .00000033 CM/SEC

### ROCKY FLATS SOLAR PONDS

### WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
2287	11/12/87 12/01/87 12/22/87 01/27/88 02/29/88 03/21/88 04/18/88	5930.70	5932.49	1.79	88.46	50.70 80.45 50.50 80.50 80.70 80.60 80.50	5881.79 5852.04 5881.99 5851.99 5851.79 5851.89 5851.99

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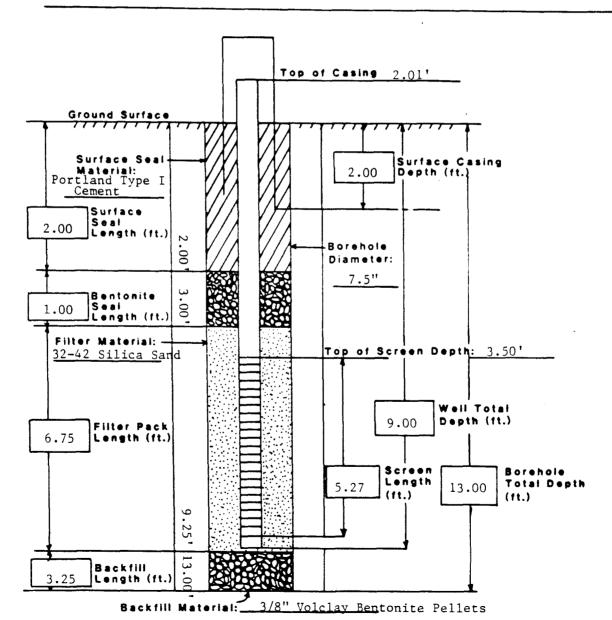
Boring No.: 37-87						
Completed as well? Yes						
Data in File						
X Log of Borehole						
X Well Construction Summaries						
X Well Development Summaries						
Hydraulic Conductivity Test Data and Results						
Packer Test Data and Results						
X Water Level Data						
X Saturated Thickness Hydrographs						

	Rocky Flats Plant; Solar Pond Area	Borehole/Well	No. <u>37-87</u>
	• N 37507.14 E 22119.81	Ground Surfac	• Elevation <u>5967.03'</u>
Total Dept	th 13.0'	Water Level	Encountered None
			Static
Drilling Co	ompany Boyles Bros.	Driller T. H	
Date Drille	od October 26, 1987		Geeney
Drilling Me	thod Hollow Stem Auger		None
	· · · · · · · · · · · · · · · · · · ·	_	
	R. Treat Geologist	Checked By _	Site Manager
		_	CEARP Manager
Comments			
/			
	Lithologic Desc	ription	Samples Collected or Other Tests Performe
0	解稿像  /		
	ARTIFICIAL FILL/D	ISTURBED	HNu background=0.6.
	0.0-2.0' SAMPLE		OVA background =
	Recovered $1.11/2.0' = 70\%$	·	2.6.
	GRAVEL AND SAND:		Ludlum background
	(5 YR 3/4) to grayish bro	own (5 YR 3/2);	= 0.0.
	medium and coarse sa		2.0-3.7': Readings in
_5_	gravel (0.55 mm to 2.25 m	nm); subangular;	augers: HNu = 0.2;
	angular and few subrocemented; light; moist.	ounded; weakly	OVA = 3.2.
	cemented, fight, moist.		
	2.0-4.0' SAMPLE		
	Recovered $1.7/2.0' = 85\%$ .		
	2.0-2.7': GRAVEL AND	SAND: same as	
	above.		1
	DOCKY DIAME		
_10	ROCKY FLATS AL	LUVIUM	
10	2.7-3.7': CLAYEY GR.	AVEL: reddish	
	brown; weakly to moder	ately cemented:	
	poorly sorted; angular	and subangular	
	gravels; few rounded; slig	ghtly calcareous;	
	light moist.		
	4.0-7.0' SAMPLE.		
	Recovered $0.8/3.0^{\circ} = 27\%$ .		
	CLAYEY GRAVEL: same	as above.	
_15	+ + +		
	7.0-9.5' SAMPLE.		
	T Recovered $2.5/2.5' = 100\%$		
	+ + + + + + + + + + + + + + + + + + +	GRAVEL: light	
	$ \begin{array}{c cccc} \hline  & & \\$	moderate brown	
	(2.0-1.5 mm) to 0.5-0.0 Ø	with gravel 0.25	1
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	tered large size	
	medium dense; weakly cer	mented; moist.	
_20		,	

Coordinates Total Depth  Drilling Comp Date Drilled  Drilling Meth	N 37507.14 E 22119.8 13.0'  Boyles Bros. October 26, 1987  Hollow Stem Auger  R. Treat	Ground Surface Water Level  Driller T. Helper B. Drilling Fluid	Keeney None
200000	Geologist	Checked by .	Site Manager
Comments -	Lith	ologic Description	Samples Collected or Other Tests Performed
5	8.5-9.5' CLAY medium plast 12" to slight highly effer blocky; weath  9.5-13.0' SAM Recovered 3. CLAYSTONE ing brownish blocky; mas plastic; weath	IPLE.  5/3.5' = 100%.  E: light gray (N 7/0) to vary  gray; slightly oxide stained  sive; highly to moderately	- ;
10 15			

#### WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area Well No. 37-87 Coordinates N 37507.14 E 22119.81 Elevation: Ground Surface 5967.03' Total Depth: Well \_\_\_ 9.0 ' Borehole <u>13.0'</u> Formation of Completion \_\_\_Rocky Flats Alluvium Casing Material Sch 5, Type 316, TFJ Stainless Casing Diameter  $\underline{\phantom{a}}2$ " ID Steel Type 316, TFJ Stainless Steel Screen Material Q. 010" wire wrap Surface Casing Diameter \_5" ID Date installed October 27, 1987 Installed By R. Treat Site Manager Geologist **CEARP Manager** Comments .



Well No.: 37-87

# WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87		Pumping		Slightly brown	Water level 7.63' from top of casing after pumping
····					
-					·

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3787	11/12/87	5967.03	5969.02	1.99	8.77	6.90	5962.12
	12/22/87					6.60	5962.42
	01/27/88					6.80	5962.22
	02/29/88					6.30	5962.72
	03/21/88					7.00	5962.02
	04/18/88					6.60	5962.42

SATURATED THICKNESS IN WELL # 37-87(SP) 100 90 80 2 20 404 20 20 60 5

SATURATED THICKNESS (ft.)

Apr-88

Jan-88

Oct-87

Jul-87

Apr-87

Jan-87

Oct-86

Jul-86

Apr-86

Jan-86

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DATE

## INDEX OF DATA

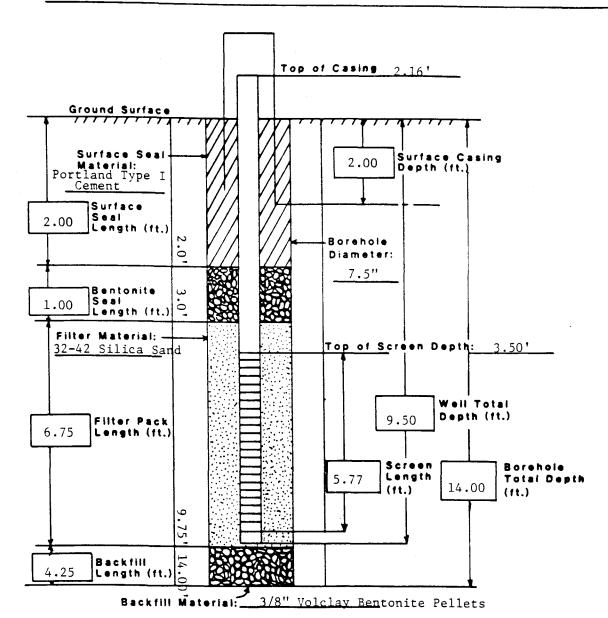
Boring No.: 38-87					
Completed as well? Yes					
Data in File					
X Log of Borehole					
X Well Construction Summaries					
X Well Development Summaries					
Hydraulic Conductivity Test Data and Results					
Packer Test Data and Results					
X Water Level Data					
X Saturated Thickness Hydrographs					

Coordinates Total Depth Drilling Com Date Drilled Drilling Met	Rocky Flats Plant; Solar Pond Ar  N 37370.70 E 22020.53  14.0'  Peny Boyles Bros.  October 27. 1987  hod Hollow Stem Auger  R. Treat  Geologist	Ground Surface Water Level E  Driller T. Hi Helper B. Ke	Elevation 5971.79' Encountered None Static gh eney None
Comments	Lithologic D	escription	Samples Collected or Other Tests Performe
5	ARTIFICIAL FIL  0.0-2.0' SAMPLE. Recovered 0.8/2.0 = 45 GRAVEL AND SAN (10 YR 8/2) to dark subangular, angular ( with possible scatte grained sand; weak moist.  2.0-4.0' SAMPLE. Recovered 0.8/2.0' = 4 GRAVEL: slightly sa sand range (3.0-2.5 Ø gravel (0.75 mm to calcareous; weakly ce well to poorly sorted;  ROCKY FLATS	5%.  D: very pale orange brown with gravel 0.5 mm to 3.25 mm) cred cobbles, finely cemented; light 5%.  Indy to very sandy; to (2.5-1.0 Ø) with 3.25 mm); angular; mented; subangular; light moist.	HNu background=0.4.  OVA background = 0.6.  Ludlum background = 0.0.  No readings above background.
- - 15 -	4.0-7.0' SAMPLE. Recovered 1.2/3.0 = 4 SAND AND GRAVEI 5/6) to pale brown (5 (3.0-2.5 Ø) and scat mm); gravel (0.25 mm cemented; poorly subangular gravel; lig	L: light brown (5 YR 5 YR 5/2) with sand tered sands (1.5-1.0 to 2.00 mm); weakly sorted; angular-	
_20	+ + +		

Coordinates  Total Depth  Drilling Comp  Date Drilled	October 27. 1987	Ground Surface Water Level E	Elevation 5971.79' Incountered None
	R. Treat Geologist		Site Manager CEARP Manager
Comments -	Litholo	gic Description	Samples Collected or Other Tests Performe
	YR 6/4) Fine-g gravel to 1.75 subrounded; so moderately calca moist.  ARAPAH  7.5-9.0': CLAYST (10 YR 8/2) to	O' = 100%.  Y SAND: light brown (5 rained sand (3.0-2.5 Ø); mm; subangular and ome scattered gravel; reous; weakly cemented;  OE FORMATION  ONE: very pale orange medium light gray (Nareous; massive: medium	
- +	gray (N 6/0); blocky; only slig weathered; moist  10.0-14.0' SAMPL Recovered 5.2/4.0 CLAYSTONE: m down to approxis light gray and se	E.  0 = 130%.  edium light gray (N 6/0)  mately 11.2'; transition to  everely oxide (Fe) stained	
- +	slightly calcare weathered; moist		

#### WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area Well No. \_\_\_\_38-87 Coordinates N 37370.70 E 22020.53 Elevation: Ground Surface 5971.79' Total Depth: Well 9.50' Borehole \_\_14.00' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, Type 316, TFJ Stainless Casing Diameter \_\_2" ID Steel Type 316, TFJ Stainless Steel Screen Material Q. 010" wire wrap. Surface Casing Diameter \_\_5" ID Date Installed October 28, 1987 Approved By Installed By R. Treat Site Manager Geologist CEARP Manager Comments



Well No.: 38-87

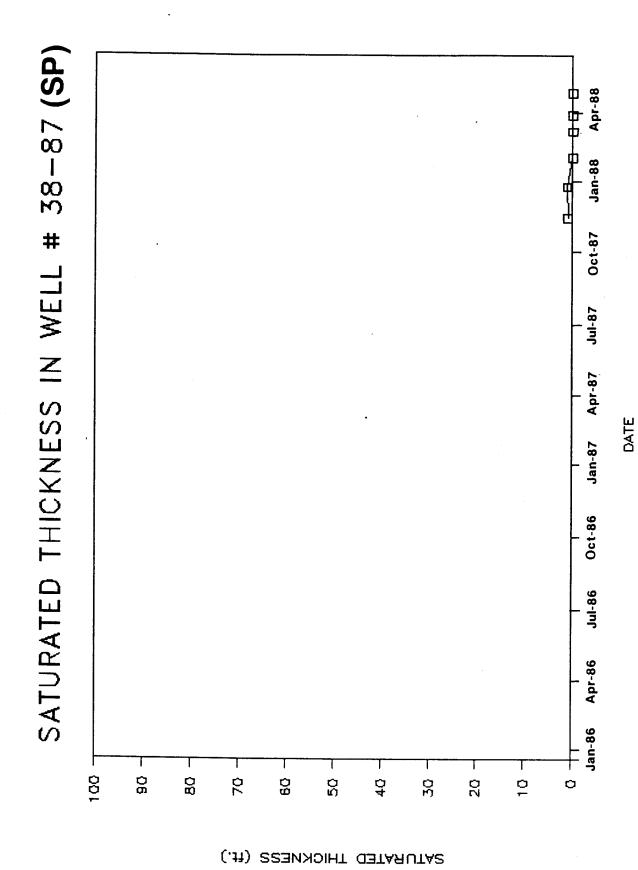
# **WELL DEVELOPMENT SUMMARY SHEET**

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87		Pumping		No particulates	Water depth from top of casing was 7.34' after pumping
				,	
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# ROCKY FLATS SOLAR PONDS

## WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3887	11/12/87	5971.79	5973.95	2.16	9.27	8.30	5965.65
	12/21/87					8.20	5965.75
	01/27/88					-1.00	DRY
	02/29/88					-1.00	DRY
	03/21/88					-1.00	DRY
	04/18/88					-1.00	DRY



## INDEX OF DATA

Boring No.: 39-87BF./SP08-87					
Completed as well? Yes					
Data in File					
X Log of Borehole					
X Well Construction Summaries					
X Well Development Summaries					
Hydraulic Conductivity Test Data and Results					
X Packer Test Data and Results					
X Water Level Data					
x Saturated Thickness Hydrographs					

Coordinates Total Depth  Drilling Com Date Drilled Drilling Meth	pany Boyles Bros. Oct. 29-30 and Nov. 6-10, 1987  Mod Hollow Stem Auger; NC Core R. Treat; K.D. Holliway  Geologist	Ground Surface Water Level E	ney None
	Lithologic Desc	ription	Samples Collected or Other Tests Performed
_5	ARTIFICIAL FILL/D  0.0-2.0' SAMPLE. Recovered 0.7/2.0' = 35%. GRAVEL AND CLAY: da (5 YR 2/2) to mixed ligh cemented; subangular. quartzite gravel; poorl plastic; slightly sandy; fi moist.  2.0-3.5' SAMPLE. Recovered 1.5/1.5' = 100% 2.0-3.2': GRAVEL ANI yellowish orange (10 YR yellowish orange (10 YR	ark dusky brown t brown; weakly subrounded y sorted; low ne-grained; light c. CLAY: dark 6/6) to moderate 5/4) with gravel	HNu background=0.2.  OVA Bachground=2.8  Ludlum background = 0.0  0.0-2.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8).  No ludlum readings above background.  2.0-3.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8).  No ludlum readings above background.
_10 _	to 4.00 mm and larger; sa 1.5 Ø to 0.5-1.0 Ø); light m 3.2-3.5': CLAY: dark yell- YR 6/6) moderately ce sandy; fine-grained; occa- tered gravel; highly plast 3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100% 3.5-5.2': CLAY: moderat	noist. owish orange (10 mented; slightly sional small scat- ic; very moist.	3.5-6.5': Upper contact sample: SP088703UC.  6.5-8.5': Contact sample: SP088706CT.  9.0-11.5': Bedrock sample: SP088709BR.
	4/4) to varying gray; costained: low plastic; fit (3.0-2.5 Ø); weakly cent fragments; moist.  ARAPAHOE FOR 5.2-6.5': CLAYEY SAI gray (N 7/0); fine-graine and finer; weakly ceme moist.	ensiderably oxide ine-grained sand iented; claystone RMATION  NDSTONE: light d sand (3.0-2.5 Ø)	11.5-14.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). 14.0-16.5': Field screen readings: HNu

Location		Borehole/Well	No. 39-87BR/SP08-87 (con't.		
Coordinates	•	Ground Surface Elevation			
Total Depth		Water Level E	ter Level Encountered		
Date Drilled Drilling Meth	od	Driller Helper Drilling Fluid	Site Manager		
		_	CEARP Manager		
Comments .					
20	Lithologic De	scription	Samples Collected or Other Tests Performed		
25	6.5-9.0' SAMPLE.  Recovered 2.0/2.5 = 80%  SANDSTONE: light (severely oxide stains)  grained sand (3.0-2.5 Ø)  massive; slight clay (severely oxide)  moist.  9.0-11.5' SAMPLE.  Recovered 2.5/2.5' = 10  CLAYEY SANDSTON  (Fe) browns to grays; for above; massive; weathered; moist.	gray (N 7/0) to ed brown; fine-; weakly cemented; binder; weathered;	19.0': Readings in augers: HNu = 0; OVA = 28.		
<u>30</u>	11.5-14.0' SAMPLE.  Recovered 1.5/2.5' = 60' CLAYEY SANDSTONIC continued moderately weathered.  14.0-16.5' SAMPLE.  Recovered 2.0/2.5' = 80 CLAYEY SANDSTON 7/0) to severely oxions and (3.0-2.5 Ø); mainstanding moderately moderately weathered.	E: as stated above coxide stained;  %.  IE: light gray (Node stained brown;			
<u>35</u>	weakly to model weathered; moist.  16.5-19.0' SAMPLE. Recovered 2.3/2.5 = 92' C'LAYEY TO VERY STONE: oxide staine gray; low plastic;	w			
40	cemented; weathered; 1				

Coordinates Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method Logged By  Geologist		ehole/Well No. 39-87BR/SP08-87 (con't und Surface Elevation er Level Encountered Static  Her per Hing Fluid Ecked By Site Manager
	Geologist	
Comments		CEARP Manager
40	Lithologic Description	Samples Collected or Other Tests Performed
45	19.0-21.5' SAMPLE. Recovered 1.4/2.5' = 56%. CLAYEY SANDSTONE: moder stained to light gray (N 7/6 fine-grained; weathered; moist.  21.5-24.0' SAMPLE. Recovered 1.8/2.5 = 72%. CLAYEY SANDSTONE: light 7/0) to severely oxide stained plastic sands (3.5-3.0 Ø to weakly cemented; massive; moi	t gray (N brown; low 2.5-2.0 Ø);
_50	24.0-26.5' SAMPLE.  Recovered 1.2/2.5 = 60%. 24.0-25.0': CLAYEY SANDS noted above; moist. 25.0-25.2': CLAYSTONE: media 4/0); massive; blocky; remain sandy (3.5-3.0 Ø); low plastic; moist.	um gray (N Test Interval # 9.
55	26.5-29.0' SAMPLE. Recovered 2.5/2.5 = 100%. CLAYSTONE: medium gray massive: medium plastic; slight now only slightly oxide staine at 28.5 and 28.8' for 2" streaks.  29.0-31.5' SAMPLE. Recovered 1.3/2.5 = 52%. SANDY CLAYSTONE: as no but now moderately oxide (1 massive; medium plastic; moist	oted above Fe) stained;
60	moist.	3

Coordinat Total Dep Drilling Co Date Drill Drilling Me	ompany od	Geologist	Ground Surface Water Level E S Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con' Elevation Incountered Static Site Manager
		30010g131	-	CEARP Manager
Comments				
60		Litholo	gic Description	Samples Collected or Other Tests Performed
65		31.5-34.0' SAMPI Recovered 2.2/2 SANDY CLAYS (31.5-32.0') the grained; severel a light medium to medium pla moist.  34.0-36.5' SAMP Recovered 2.5/2 CLAYSTONE:	1.5' = 88%.  STONE: upper formation in slightly sandy, fine- y oxide stained brown to gray (N 6/0); massive; low astic; weathered; blocky;	69.40-79.05: Packer Test Interval # 8.
<u>.70</u>		plastic; blocky grained; moist.  36.5-39.0' SAMP Recovered 1.7/2 CLAYSTONE: 4/4) to mediumassive; blocky	; slightly sandy; fine- LE.	· ·
_75		(N 4/0); massi fine-grained; m 41.5-44.0 SAMI Recovered 1.2/2	2.5 = 88%. CHALE: medium dark gray ve; blocky slightly sandy; edium plastic; moist.  PLE. 2.5 = 48%.	
80			SHALE: medium dark massive; medium plastic ky; just slightly sandy;	4 19

Comments    Continued   Company   Continued   Comments	Location		Borehole/Well	No. 39-87BR/SP08-87 (con't.
Drilling Company Date Drilled  Drilling Method Logged By  Gaologist  Checked By  Gaologist  Checked By  Site Manager  CEARP Manager  Test Interval # 7.  38.70-98.35: Packer  Test Interval # 6.  98.35-108.00: Packer  Test Interval # 5.  SANDY CLAYSTONE: olive gray (5 Y A)  41) to olive black (5 Y 2/1); sand very  fine-grained (3.5-4.0 Ø), well sorted:  consolidated; blocky: medium hardness: some organics; damp.  45.4-49.5' SAMPLE  Recovered 4.10/4.10' = 100%.  SANDY CLAYSTONE: olive gray (5 Y R 8/1)  increasing down core when get into sand- stone/claystone interbed; consolidated; hard; at 45.80' have a leaf imprint: occa- sional organics throughout core; damp.	Coordinates		Ground Surface	Elevation
Drilling Company Date Drilling Drilling Method Logged By  Geologist  Checked By  Site Manager  CEARP Manager  C	Total Depth		Water Level E	ncountered
Date Drilling Method Logged By  Geologist  Checked By  Site Manager  CEARP Manage			s	itatic
Date Drilling Method Logged By  Geologist  Checked By  Site Manager  CEARP Manager  Control of the Manager  CEARP Manager  CEARP Manager  CEARP Manager  CEARP Manager  Control of the Manager  CEARP Manager  CEARP Manager  CEARP Manager  CEARP Manager  CEARP Manager  Cother Tests Performed  A13.4-4.5' SAMPLE  Recovered 1.68/4.10' = 41%.  RD = 3.5' CLAYSTONE: dark  consolidated; blocky; soft to medium hardness; some organics; damp.  42.35-44.03': SANDY SILTY CLAYSTONE: dark  consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE.  Recovered 4.10/4.10' = 100%.  RD = 3.55/4.10' = 87%.  SANDY CLAYSTONE: olive gray (5 Y A/1) to olive black (5 Y 2.71); sand very fine-grained (3.5-4.0 0); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 0); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.	Drilling Company		Driller	
Geologist  Geologist  Checked By  Site Manager  CEARP Manager  CEAR Manager  CEARP Manager  CEARP Manager  CEARP Manager  CEARP Manager  CEARP Manager  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Packer  Test Interval # 7.  29.05-88.70: Pac				
Comments    Class   Stamples   Collected or Other Tests   Performed				
Lithologic Description    A1.3-4.5.4 SAMPLE   Recovered 1.68/4.10" = 41%. RQD = 1.04/1.68" = 62%. 41.3-4.18.** CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted: unconsolidated; blocky; soft to medium hardness; damp.   42.35-44.03": SANDY SILTY CLAYSTONE: dirk line-grained (3.5-4.0), well sorted: consolidated; blocky; medium hardness; some organics; damp.   45.4-49.5" SAMPLE   Recovered 4.10/4.10" = 100%. RQD = 3.55/4.10" = 87%. SANDY CLAYSTONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0); well sorted: consolidated: blocky; medium hardness: some organics; damp.   45.4-49.5" SAMPLE   Recovered 4.10/4.10" = 100%. RQD = 3.55/4.10" = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0); missing ray (5 YR 8/1) increasing down core when get into sand: sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand: stone/claystone interbeds; consolidated; hard; at 45.80" have a leaf imprint: occasional organics throughout core; damp.				
Lithologic Description  Samples Collected or Other Tests Performed  11.3-45.4' SAMPLE. Recovered 1.68/4.10' = 41%. ROD = 1.04/1.68' = 62%. ROD = 1.04/1.68' = 62%. 14.3-4.18: CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted: unconsolidated; blocky; soft to medium hardness; damp.  42.35-44.03': SANDY SILTY CLAY-STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 @), well sorted: consolidated; blocky; medium hardness: some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. ROD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 @); well sorted: coccasional lenses of a coarser grained sand (3.0-2.5 @); pinkish gray (5 YR 8/1) increasing down core when get into sand stone/claystone interbeds: consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.		Geologist		Site Manager
Lithologic Description    3amples Collected or Other Tests Performed				CEARP Manager
41.3-45.4' SAMPLE.  Recovered 1.68/4.10' = 41%.  RQD = 1.04/1.68' = 62%.  41.3-41.8': CLAYSTONE PLUG. 41.3-41.8': CLAYSTONE PLUG. 41.3-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp.  42.35-44.03': SANDY SILTY CLAY- STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 0), well sorted; consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE.  Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 0); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 0); pinkish gray (5 YR 8/1) increasing down core when get into sand- stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occa- sional organics throughout core; damp.	Comments			
41.3-45.4' SAMPLE.  Recovered 1.68/4.10' = 41%.  RQD = 1.04/1.68' = 62%.  41.3-41.8': CLAYSTONE PLUG. 41.3-41.8': CLAYSTONE PLUG. 41.3-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp.  42.35-44.03': SANDY SILTY CLAY- STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 0), well sorted; consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE.  Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 0); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 0); pinkish gray (5 YR 8/1) increasing down core when get into sand- stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occa- sional organics throughout core; damp.	80	Lithol	ogic Description	
Recovered 1.68/4.10' = 41%. RQD = 1.04/1.68' = 62%.  41.3-41.8: CLAYSTONE PLUG. 41.8-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp.  42.35-44.03': SANDY SILTY CLAY- STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand- stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occa- sional organics throughout core; damp.		\$- 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ri F	
41.3-41.8: CLAYSTONE PLUG. 41.8-42.35: SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp. 42.35-44.03: SANDY SILTY CLAY-STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 Y R 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				·
41.8-42.35': SILTY CLAYSTONE: dark gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted: unconsolidated; blocky; soft to medium hardness; damp. 42.35-44.03': SANDY SILTY CLAY-STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted: consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 Y R 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				
gray (N 3/0) to olive black (5 Y 2/1); some very fine-grained sand; well sorted; unconsolidated; blocky; soft to medium hardness; damp.  42.35-44.03': SANDY SILTY CLAY-STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.				
some very fine-grained sand; well sorted: unconsolidated; blocky; soft to medium hardness; damp.  42.35-44.03: SANDY SILTY CLAY-STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness: some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				l est Interval # 7.
unconsolidated; blocky; soft to medium hardness; damp.  42.35-44.03': SANDY SILTY CLAY-STONE: clive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics: damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: clive gray (5 Y 4/1) to clive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				88.70-98.35': Packer
hardness; damp. 42.35-44.03': SANDY SILTY CLAY-STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted: consolidated; blocky; medium hardness: some organics; damp.  45.4-49.5': SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.		unconsolidated	; blocky; soft to medium	Test Interval # 6.
42.35-44.03: SANDY SILTY CLAY- STONE: olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø), well sorted: consolidated; blocky; medium hardness: some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.	85	hardness; damp	o.	
fine-grained (3.5-4.0 Ø), well sorted; consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				
consolidated; blocky; medium hardness; some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%.  SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.				
some organics; damp.  45.4-49.5' SAMPLE. Recovered 4.10/4.10' = 100%. RQD = 3.55/4.10' = 87%. SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				
Recovered 4.10/4.10' = 100%.  RQD = 3.55/4.10' = 87%.  SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				
Recovered 4.10/4.10' = 100%.  RQD = 3.55/4.10' = 87%.  SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				
RQD = 3.55/4.10' = 87%.  SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted: occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				
SANDY CLAYSTONE: olive gray (5 Y 4/1) to olive black (5 Y 2/1); sand very fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sandstone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.		307		
fine-grained (3.5-4.0 Ø); well sorted; occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.	90			
occasional lenses of a coarser grained sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sandstone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.		4/1) to olive	black (5 Y 2/1); sand very	
sand (3.0-2.5 Ø); pinkish gray (5 YR 8/1) increasing down core when get into sand-stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.				
increasing down core when get into sand- stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint: occa- sional organics throughout core; damp.				
stone/claystone interbeds; consolidated; hard; at 45.80' have a leaf imprint; occasional organics throughout core; damp.				
hard; at 45.80' have a leaf imprint: occasional organics throughout core; damp.		stone/clayston	e interbeds; consolidated;	1
95		hard; at 45.80	have a leaf imprint: occa-	
		sional organic	s throughout core; damp.	
100	95	+		
100				
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	100			

Location	Boret	ole/Well No. 39-87BR/SP08-	-87 (con't		
Coordinates		d Surface Elevation			
		Water Level Encountered			
		Static			
Drilling Company	Drille				
	· <del>-</del>				
		g Fluid			
	Geologist	site Man	1901		
		CEARP Ma			
Comments					
100	Lithologic Description	Samples Colle Other Tests Po	cted or erformed		
			<b>—</b>		
	$\frac{49.5-54.0' \text{ SAMPLE.}}{\text{Recovered } 4.20/4.50' = 93.30\%.}$		ļ		
	RQD = 2.70/3.90' = 69%.	108.00-117.65': Pa	cker		
	49.5-50.7': SANDY CLAYSTON	E: olive Test Interval # 4.			
	gray (5 Y 3/2); cuttings fro	n above;	.		
	T moist.	F: olive Test Interval # 3.	L L		
	50.7-54.0': SANDY CLAYSTON gray (5 Y 4/1) to olive black (	L. Olive			
105	same as 45.40-49.50' interval;		cker		
	have some fine-grained sand sta	1			
	yellowish orange (10 YR 6/6);		1.		
	fine-grained sand increase dow				
	53.5'-54.0' clay is predominant; d	amp. lest interval # 1.			
	54.0-57.0' SAMPLE.				
	Recovered $3.3/3.0^{\circ} = 110\%$ .				
	+ RQD = 2.45/3.30' = 74%.				
110	SANDY CLAYSTONE: same				
	with nodules of very pale orang				
	8/2) clay and very fine-grained				
	creasing down core; at 56.22 imprint; less fine-grained san				
	damp.	d lenses.			
	57.0-61.0' SAMPLE. Recovered 4.0/4.0' = 100%.				
	Recovered $4.0/4.0 = 100\%$ .				
115	SANDY CLAYSTONE: same	is above			
	with more fine-grained sand le	ises; clay			
	.     nodules still present; more orga	aics than			
	above; clay increases down	ore with			
	60.0-61.0' mostly clay; damp.				
	61.0-65.0' SAMPLE.				
	Recovered $0.0/4.0' = 0\%$ .				
	Lost core.				
120					
			<del></del>		

Location		Borehole/Well	No. 39-87BR/SP	08-87 (con't.)
Coordinates		Ground Surface	Elevation	
		Water Level E	ncountered	
		•	Static	
Drilling Company _				
Date Drilled				
Drilling Method				
Logged By	Geologist			
	Geologist	• • • • • • • • • • • • • • • • • • •	Site M	270901
		-	CEARP	Meneger
Comments				
3- 2	/ . /		Samples Ce	illected or
120	Lithold	gic Description	Other Tests	Performed
	65.0-66.0' SAMP			
	Recovered 1.5/1	.0' = 150%.		1
	+ RQD = 0%.	ight greenish gray (5 GY		
		reenish grav (5 GY 2/1)		
	1 1 - 2	rest of core olive black (5		
		ry fine-grained sand; core		
125		drilling; appears un-		
	consolidated and	d blocky; damp to moist.		
Account for the	+ 66.0-70.0 SAMP	LE.		
	Recovered 5.0/4			
	$\uparrow$ RQD = 2.6/5.0'			
	1 1 1	YSTONE: olive black (5 Y		
		h black (5 YR 2/1); trace fine-grained sand; some		
		; consolidated; damp.		
130		YSTONE: olive black (5 Y		
		h black (5 YR 2/1); trace		
		fine-grained sand; some		
		r; consolidated; damp. YSTONE: olive black (5 Y		
	1 1 1	black (5 GY 2/1) to black	T .	
		ilt; blocky; damp.		
		YSTONE: medium bluish		
		to medium gray (N 5/0);		
135	highly plastic; b	olock; moist.		
	70.0-74.0° SAMP	T E		
	Recovered 0.6/4			
·」	$RQD = 0^{\sigma_0}.$			
		olive black (5 Y 2/1) to		
+		gray $(N - 4/0)$ ; blocky;		
<b>注</b> 題	homogenous; pl	astic: damp.		
经国				·
140			<u> </u>	

Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method Logged By  Geologist  Comments		Driller Helper Drilling Fluid	Static  Site Manager  CEARP Manager	
	Lithol	ogic Description	Samples Collected or Other Tests Performed	
	72.15-74.0': CLAY Y 2/1) with I blocky, homoger 74.0-76.0': CLAY 2/1) to medium homogenous; play  76.0-80.0' SAMP Recovered 2.13/ RQD = 1.50/2.1 CLAYSTONE: consist; some organized sand blocky; medium  80.0-82.0' SAMP Recovered 2.62/ RQD = 1.62/2.6 SANDY CLAY 2/1); some very sorted, subang grained sand interbeds; some	2.0' = 193%.  5' = 59%.  from previous run.  AYSTONE: olive black (5 enses of black (N 1/0); hous; plastic; damp.  YSTONE: olive black (5 Y m gray (N 5/0), blocky, astic; damp.  LE.  4.0' = 53%.  3' = 70%.  blive black (5 Y 2/1); some ganics; trace very fine-interbeds; homogenous; hardness; damp.  LE.  (2.01 = 131%.  2' = 62%.  STONE: olive black (5 Y fine-grained sand, poorly ular to subrounded fine-occurring in lenses and esilt; some organics; small ocky; fairly homogenous;		

Drilling Company  Date Drilled  Drilling Method  Logged By  Geologist  Comments		DrillerHelperDrilling Fluid Checked By	Static  Site Manager  CEARP Manager
	Litholo	gic Description	Samples Collected er Other Tests Performed
	STONE INTERB 2/1) to dark gray grained to fine occurs in lenses: stringers of coal no orientation; s consolidated; m 83.0-84.0' have si sorted fine-grai subrounded: quay Y 8/1); damp wit  84.0-86.0' SAMPI Recovered 2.0/2.1 RQD = 1.76/2.0' SANDY CLAYS 2/1) to dark gra gray (5 Y 8/1) occasional, poc stringers of coals consolidated; dan  86.0-88.0' SAMPI Recovered 2.0/2.0' RQD = 2.0/2.0' SANDY SILTS'	O' = 119%.  = 90%.  TONE/CLAYEY SAND- DEDS: olive black (5 Y (N 3/0); sand very fine- grained, poorly sorted, and interbeds; occasional in small fractures with some silt; some organics; edium hardness; from nall lenses of fairly well ned (3.0-2.5 Ø) sand. rtzitic, yellowish gray (5 h sand lenses moist.  E. O' = 100%.  = 86%.  TONE: olive black (5 Y y (N 3/0) with yellowish fine-grained sand lenses orly sorted; occasional ; some silt; some organics; mp.  E. O' = 100%.	

Static St			
Static Static Static Static Static Static Orillog Company Drillog Helpor Orilling Fluid Checked By Site Man CEARP Was Ceared 4.0/4.0' = 100%.  ROD = 3.63/4.0' = 91%.  88.0-92.0' SAMPLE. Recovered 4.0/4.0' = 100%. ROD = 3.63/4.0' = 91%. some clay; lots of silt; some very fine-grained fairly well sorted sand with lenses of a fine-grained, well sorted sand; damp. 91.0-92.0' SILTY SANDSTONE: olive black (S Y 2/1) with yellowish gray (5 Y 8/1) fine-grained sand, fairly well sorted; sand in lenses and interbeds; some clay; some organics; small planes of lamination present in sand lenses; consolidated; damp.  92.0-94.0'S SILTY SANDSTONE: olive black (S Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; sand in lenses and interbeds; some clay; some organics; small planes of lamination present in sand lenses; consolidated; damp.  92.0-94.0'S SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.83/4.0' = 96%. 92.0-94.25' SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated; damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
Illing Company Into Drilled  Holper  Drilling Fluid  Gheeked By  Geologist  Checked By  Geologist  Checked By  Geologist  CEARP Man  CEAR  Sambles Celle Other Tests  Sambles Celle Other Tests  Sambles Celle Other Man  CEARP Man  CEARP  Sambles Celle Other Man  CEA			
Tilling Method  Deged By  Geologist  Checked By  Geologist  Checked By  Site Man  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  CEARP Ma  Samples Cells Other Tests P.  Samples Cells			
Geologist  Checked By  Geologist  Checked By  Geologist  Checked By  Clarp Wa  CEARP Wa  CEARP Wa  CEARP Wa  CEARP Wa  Samples Cells Other Yesta P.  Samples			
CEARP Me  Semments  CEARP Me  CEARP Me  Stite Man  CEARP Me  Stite Man  CEARP Me  Stite Man  CEARP Me  Stite Man  CEARP Me  Stite Man  CEARP Me  Stite Man  CEARP Me  Stite Man  CEARP Me  Stite Man  CEARP Me  Stite Man  Stite Man  Stite Man  Stite Man  Stite Man  CEARP Me  Stite Man  St			
Clithologic Description  Samples Celle  St. Other Yests P  St. Other Yests P  Lithologic Description  Samples Celle Other Yests P  St. Other Yests			
Lithologic Description    38.0-92.0' SAMPLE.			
Lithologic Description    Samples College   Samples College			
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present in sand lenses; consolidated; damp.  92.0-96.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.83/4.0' = 96%.  92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp.  94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
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92.0-96.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 3.83/4.0' = 96%. 92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-	-		
Recovered 4.0/4.0' = 100%.  RQD = 3.83/4.0' = 96%.  92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp.  94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-	· [		
Recovered 4.0/4.0' = 100%.  RQD = 3.83/4.0' = 96%.  92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp.  94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
92.0-94.25': SILTY SANDSTONE: olive black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
black (5 Y 2/1) to yellowish gray (5 Y 8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE; same as above with finer-			
8/1); very fine-grained to fine-grained sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-	1		
sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp.  94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
sand, fairly well sorted; some planes of lamination; less silt and clay than above; some occasional organics; consolidated: damp.  94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
some occasional organics; consolidated: damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
damp. 94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-			
94.25-95.2': SANDY SILTSTONE/SILTY SANDSTONE: same as above with finer-	1		
SANDSTONE: same as above with finer-			
	1		
grained sand; damp.			
95.2-96.0': SILTY SANDSTONE: same as	į		
92.0-94.25'; damp.			
† † †			
Page 10 of 10	į		

Total Depth  Drilling Company Date Drilled  Drilling Method Logged By  Comments	Geologist	Water Level E  Driller  Helper  Drilling Fluid	Site Manager  CEARP Manager
	Litho	logic Description	Samples Collected or Other Tests Performed
	black (5 Y 2/fairly well s some clay; some planes; consol 97.2-97.35' hay gray (5 Y 6/1 fairly well s sand; damp. 97.35-99.0': SII 2/1); very fin claystone dow 98.85'; consoli occasional noc YR 7/4) clay, some organics; 99.0-100.0': Cl black (5 Y 2/sand; lots of dated; some of	4.0' = 107%.  2 = 93%.  ANDY SILTSTONE: olive 1); very fine-grained sand, orted in siltstone matrix; the organics; some lamination idated; at 96.10-96.50' and the lenses of a light olive to olive black (5 Y 2/1), sorted, moist, fine-grained at a control of the	

Lithologic Description    100.0-104.0' SAMPLE   Recovered 2.61/4.0' = 65.3%.   RQD = 2.50/2.61' = 96%.   100.0-101.0': CLAYEY SILTSTONE: olive black (5 Y 2/1); trace very fine-grained sand; fairly homogenous; consolidated; damp.   101.0-101.5': SILTY SANDSTONE: yellowish gray (5 Y 8/1) to olive black (5 Y 2/1); sand from very fine-grained in upper portion to fine-grained in lower portion fairly well sorted, subrounded; some silt; little clay; consolidated; damp to moist.   101.5-102.61': CLAYSTONE: medium dark gray (N 4/0) to dark gray (N 3/0); highly plastic; blocky; homogenous; no silt or sand; damp to moist.   104.0-108.0' SAMPLE   Recovered 4.0/4.0' = 100%.   RQD = 3.27/4.0' = 82%.   CLAYSTONE: olive black (5 Y 2/1) to dark gray (N 3/0); trace silt; blocky; homogenous; damp to moist.	Coordinates _ Total Depth _  Drilling Compa Date Drilled _  Drilling Methol Logged By	ny			Ground Surfac Water Level   Driller Helper Drilling Fluid	No. 39-87BR/SP  • Elevation Encountered Static  Site M  CEARP	
momogenous, damp to moist			100.0-104.0' Recovered RQD = 2.50 100.0-101.0': black (5 Y sand; fairl damp. 101.0-101.5' lowish gray 2/1); sand upper port portion fa some silt; to moist. 101.5-102.6! gray (N 4/0 plastic; blo sand; damp  104.0-108.0' Recovered RQD = 3.27 CLAYSTOR dark gray	SAMPLE.  2.61/4.0' = 65.3%  2/2.61' = 96%.  CLAYEY SIL'  2/1); trace very  ly homogenous:  SILTY SAN  (5 Y 8/1) to o from very f ion to fine-grainly well sorte little clay; cons  1': CLAYSTONE  (1) to dark gray  cky; homogenous  to moist.  SAMPLE.  4.0/4.0' = 100%.  7/4.0' = 82%.  NE: olive black  (N 3/0); trace	TSTONE: olive ry fine-grained; consolidated; DSTONE: yellive black (5 Y ine-grained in lower d, subrounded; colidated; damp d: medium dark (N 3/0); highly ous; no silt or e silt; blocky;		Performed

Coordinates Total Depth  Drilling Company Date Drilled Drilling Method Logged By  Geolog	Driller Helper	Surface Elevation Level Encountered Static  g Fluid ed By Site Manager CEARP Manager
	Lithologic Description	Samples Collected or Other Tests Performed
R R 10 2/ cl	28.0-112.0' SAMPLE. ecovered 3.9/4.0' = 98%. QD = 3.49/3.9' = 89.5%. 28.0-110.0': SILTSTONE: olive bladed by the same organics; fairly home on solidated; hard; more sand downer. 20.0-111.90': SANDSTONE: dark gray (5 G 4/1) to greenish gray (5 gray fine-grained (3.5-4.0 Ø) to the same of the sa	d; some ogenous; wn core; greenish (5 GY Y 8/1); o fine-sorted; olt; trace organics, as goes s of the

Location	Borehole/Well	No. 39-87BR/SP08-87 (con't		
Coordinates				
Total Depth	Water Level Encountered			
		Static		
Drilling Company				
Date Drilled				
Drilling Method				
Logged By  Geologist	Checked By _	Site Manager		
	_	CEARP Manager		
Comments				
Lithologic I	Description	Samples Collected er Other Tests Performed		
112.0-116.0' SAMPLE. Recovered 4.67/4.0' =				
$\begin{array}{c} T & Receivered 4.67/4.0 = \\ RQD = 3.23/4.67' = 69 \end{array}$				
+ + 112.0-112.5': SANDY		1		
black (5 Y 2/1); 409	% silt; 40% organics;			
+ + 20% sand; consolidate				
112.5-115.75': SANDS'		1		
+ + + (5 GY 6/1) to dark				
4/1) with some yello fine-grained (3.0-2.0				
grained (2.0-1.5 Ø)				
core: occasional lens				
associated with				
T T throughout the core				
	edding; consolidated;			
1 1	racture of coal with			
small fractures of co		-		
ring throughout the c		1		
3 3 1	ery silty; sand fine-			
	i-grained as above.			
	many organics with			
t tay associated; very	hard: consolidated:			
damp.				
TTT				
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1 1				

Coordinates Total Depth  Drilling Compan Date Drilled  Drilling Method	Geologist	Ground Surface Water Level E  Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con't. Elevation Incountered Static Site Manager CEARP Manager
		Lithologic Description	Samples Collected er Other Tests Performed
	Recover RQD = 116.0-11 AND C 116.3-11 black (1 8/1) an grained organic moist. 116.9-11 STONE influen	20.0' SAMPLE.  red 2.0/4.0' = 50%. 0.45/2.0' = 22.5%. 16.3': CUTTINGS OF SILTSTONE LAYSTONE: reworked. 16.9': SANDY SILTSTONE: olive 5 Y 2/1) with yellowish gray (5 Y 1rd greenish gray (5GY 6/1) fine- sand in lenses; some clay; some s; massive; consolidated; damp to 18.0': CLAYEY SANDY SILT- 10 olive black (5 Y 2/1); heavy silt 15 ce; sand is very fine-grained; some 17 silve silve; consolidated; damp.	

Location  Coordinates  Total Depth  Drilling Company  Date Drilled  Drilling Method  Logged By  Geologist	Ground Surfac Water Level Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con't.)  • Elevation  Encountered  Static  Site Manager  CEARP Manager
Comments		CEARP BORGOF
Lithologo Lithol	gic Description	Samples Collected or Other Tests Performed
black (5 Y 2/1) 2/1); trace very organics; occas massive; blocky; solidated; damp. 120.0-121.4': CLA greenish gray (5 (5 GY 2/1); trac in lenses; some of dated; damp. 121.4-122.0': SAN gray (5 G 4/1) 2/1); some silt in to sand; fine-gra (2.0-1.5 Ø) subangular; felc fairly well sorte	0' = 230%.	

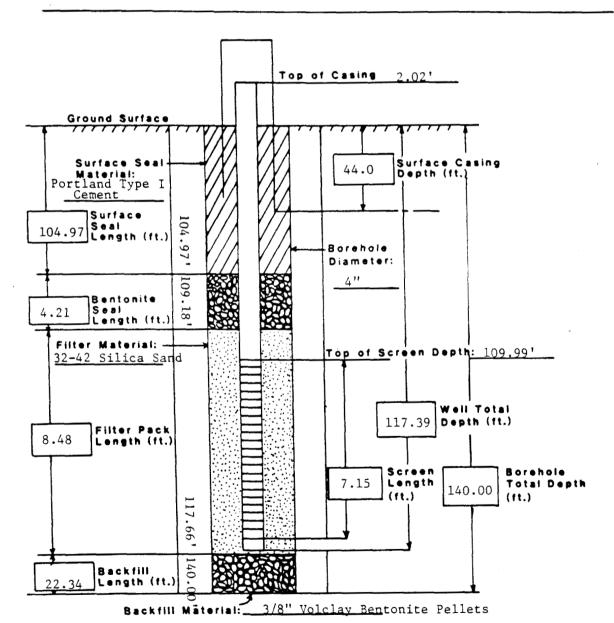
Coordinates  Total Depth  Drilling Company  Date Drilled  Drilling Method	Geologist	Ground Surfac Water Level   Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con't.  • Elevation  Encountered  Static  Site Manager  CEARP Manager
	Lith	ologic Description	Samples Collected or Other Tests Performed
	RQD = 3.65/4 122.0-122.85': (5 G 6/1) to some silt; fin (2.5-1.5 Ø) subangular, organics; mas 122.85-126.0': greenish gray (5 G 2/1); vlenses of fin sand as a organics morwith organic giving way to more organic damp.  126.0-130.0' S Recovered 1. RQD = 0.75/SANDSTONE to light gray fine-grained quartzitic massive; organics; sand organics; some organics; some organics; some silt in the same organics; some some silt; sand organics; some organics; some some silt; sand organics; some sil	0/4.0' = 100%. 4.0' = 91%. SANDSTONE: greenish gray of greenish black (5 G 2/1); e-grained to medium-grained sand, subrounded to fairly well sorted; some sive; consolidated; moist.  SANDSTONE/SILTSTONE: (5 G 6/1) to greenish black very fine-grained sand with e-grained to medium-grained bove (122.0-122.85'); some e than above; clay influence s; sand decreases down core of more silt, a little clay, and ics; massive; consolidated;  SAMPLE. 5/4.0' = 37.5%.	

nte Drilled	Geologist	Driller Helper Drilling Fluid	Static
	Geologist	_	
omments			CEARP Manager
	Litholog	ic Description	Samples Collected or Other Tests Performed
	greenish gray (5 of G 2/1); no of fairly homogenous dry.  129.4-129.7': SILT as above; damp to 129.7-130.0': SILT above with some sand; moist.  130.0-132.0': SILT greenish gray (5 of G/1); very fine-grained (3.0-sand; some silt: damp to moist.  132.0-136.0' SAME Recovered 4.18/4.  RQD = 3.76/4.18' 132.0-132.4': SAN gray (5 G 4/1) to fine-grained (2.0-sorted; some silt damp.  132.4-136.0': SILT greenish gray (5 of G/1); trace silt in top of cor-	0' = 217.5%.  = 84.6%. YEY SILTSTONE: dark G 4/1) to greenish black organics, hard; massive; is; consolidated; damp to TY CLAYSTONE: same odry. Y SANDSTONE: same as clay; very fine-grained TY SANDSTONE: dark G 4/1) to greenish grav ine-grained (3.5-4.0 Ø) to 2.5 Ø), fairly well sorted massive; consolidated:  PLE 0' = 104.5%.	

ordinates  otal Depth  Orilling Company Date Drilled		Ground Surfac Water Level Driller	No. 39-87BR/SP08-87 (con't  • Elevation  Encountered  Static
orilling Method ogged ByG			
G	eologist		Site Manager
omments			CEARP Manager
	Litho	logic Description	Samples Collected or Other Tests Performed
	136.0-140.0' SA Recovered 2.0/ RQD = 0.6/2.0' CLAYSTONE: dark gray (N 3 massive; blocky	4.0' = 50%.	

## WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area Well No. 39-87BR/SP08-87 Coordinates N 38094.04 E 22166.32 Elevation: Ground Surface 5947.10' Total Depth: Well 117.39 Top of Casing \_\_5949.12' Borehole \_\_140.001 Formation of Completion \_\_Arabahoe Formation 2" ID Casing Material Sch 5, Type 316, TFJ Stainless Casing Diameter Steel
Steel
Steel
National October 17-18, 1987
Stainless Steel Surface Casing Diameter \_\_ 5" ID Installed By K.D. Holliway Site Manager Geologist CEARP Manager Comments Surface casing set to 44.0' by R. Treat on October 30, 1987.



Well No.: 39-87BR

# WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87		Pumping		Dirty brown	Water level 43.53' after pumping
		,			
-				·	

			-	PACKER	ER TEST	DATA SI	SHEET		:		,
Job No.:	2029-17-02	12							Static Wa	Static Water Level: 83,98	13,98
Location	Rocky Fla	its Plant;	Location: Rocky Flats Plant; Solar Ponds	s Area					Date of V	Date of Water Level: 4/18/88	4/18/88
Well No.:	39-87BR	~							Page 1	- of 2	
Borehole	Borehole Diameter:	0,333	_	35	Comments: Interval #2	Interval #	12 (117.65	- 127.30')	failed		-
Acrylic T	Acrylic Tube Diameter:	er: 0.1663	3,		1 1						
Test interval	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Pressure	Gage Height	Avg. H <sub>2</sub> O Height	Gage Height +Avg. H2O Height	Δħ	Date of Test	Lithology	Geologist
1	122.68	132.33	15	0	5.90	4.25	10.15	0.03	11/11/87	Kass	Крн
			15	29.7	5.90	1	5.90	0.12	11/11/87	Kass	KDH
			15	0	5.90	2,712	8.702	-0.02	11/11/87	Kass	КВИ
3	115.65	125.30	15	0	5.90	3.94	9.84	-0.08	11/11/87	Kass	KDH
			15	28	5.90	-	5.90	1.21	11/11/87	Kass	KDH
			15	0	5.90	2.528	8.428	-0.095	11/11/87	Kass	КВН
7	108.00	117.65	15	0	5.90	4.172	10.162	-0.025	11/11/87	Kass	КДН
			15	26	5.90	1	5.90	0.18	11/11/87	Kass	КДН
			15	0	5.90	3.558	9.458	-0.01	11/11/87	Kass	KDH
5	98.35	108.00	15	0	5.90	3.904	9.804	-0.01	11/12/87	KCL	КДН
			15	24	5.90	1	5.90	0.11	11/12/87	KCL	Крн
			15	0	5.90	2.519	8.419	-0.035	11/12/87	KCL	КДН
9	88.70	98.35	15	0	5.90	5.638	11.538	-0.010	11/12/87	KCL	КДН
			15	21.7	5.90	1	5.90	0.07	11/12/87	KCL	KDH
			15	0	5.90	5.537	11.437	-0.015	11/12/87	KCL	KDH
7	79.05	88.70	15	0	5.90	4.437	10.337	0.02	11/12/87	KCL	KDII
			15	19.4	5.90	ı	5.90	0.08	11/12/87	KCL	KDH
			15	0	5.90	4.228	10,128	-0.015	11/12/87	KCL	KDH
					,						

			-	PACKER	TEST	DATA SI	SHEET				
Job No.:	Job No.: 2029-17-02	2							Static Wa	Static Water Level: .	-
Location:	Rocky Fla	ts Plant:	Location: Rocky Flats Plant; Solar Ponds Area	Area					Date of W	Date of Water Level:	
Well No.:	Well No.: 39-87BR (cont'd.)	(cont'd.)							Page 2	- of _2_	
Borehole	Borehole Diameter:			ပိ 	Comments:_						
Acrylic Tu	Acrylic Tube Diameter: _	er:			1 1						
Test interval No.	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Preseure	Gage Height	Avg. H <sub>2</sub> O Height	Gage Height +Avg. H2O Height	Δh	Date of Test	Lithology	Geologist
8	05.69	79.05	15	0	5.90	3.68	9.58	0.00	11/12/87	KCI.	КЪН
			15	17.1	5.90	1	5.90	0.10	11/12/87	KCL	КДН
			15	0	5.90	1.760	7.660	0.00	11/12/87	KCL	Крн
6	59.75	69.40	15	0	5.90	4.060	96.6	0.00	11/12/87	KCL	КДН
			15	14.8	5.90	1	5.90	0.13	11/12/87	KCI.	KDII
			15	0	5.90	2.81	8.71	00.0	11/12/87	KCL	КДН
10	50,10	59.75	15	0	5.90	3,794	9,694	-0.050	11/13/87	KCL	КДН
			15	15.08	5.90	1	5.90	0.05	11/13/87	KCL	KDH
			15	O	5.90	3.585	9.485	-0.015	11/13/87	KCL	KDH
				-							

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 50.10 - 59.75
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$$

1ST P1/3 TEST TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 54.92 + 5.90 + 15.08 \* 2.31 = 95.66
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN K = .00000003 CM/SEC

2ND P1/3 TEST ABORTED

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02 DATE TESTED: 11/12/87 BY: KD HOLLIWAY TEST INTERVAL (FEET BELOW G.S.): 59.75 - 69.40

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 83.98

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 9.96 + .00 \* 2.31 = 74.53

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;

P2/3 TEST

Q = INJECTION RATE = .00018825 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 5.90 + 14.80 \* 2.31 = 104.66

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

 $K = .00000006 \, \text{CM/SEC}$ 

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 8.71 + .00 \* 2.31 = 73.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE Q=0

# PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 69.40 - 79.05
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGH

= 74.23 + 9.58 + .00 \* 2.31 = 83.81 R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN<math>K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE; Q=0

P2/3 TEST

Q = INJECTION RATE = .00014480 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 5.90 + 17.10 \* 2.31 = 119.63
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN K = .00000004 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 74.23 + 7.66 + .00 \* 2.31 = 81.89
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE; Q=0

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 79.05 - 88.70
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00002896 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.88 + 10.34 + .00 \* 2.31 = 94.21

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00011584 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 5.90 + 19.40 \* 2.31 = 134.59
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000006 FT/MIN
K = .00000003 CM/SEC

2ND P1/3 TEST

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 88.70 - 98.35

MATERIAL TESTED: ARAPAHOE CLAYSTONE DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = ----- LN(--)$$
  
2(PI)(L)(H) R

1ST P1/3 TEST TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00010136 (FEET3/MIN) L = LENGTH OF TEST INTERVAL = 9.65 FEET TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT + GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 21.70 \* 2.31 = 140.01

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN K = .00000002 CM/SEC

2ND P1/3 TEST

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 98.35 - 108.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = - \frac{Q}{2(PI)(L)(H)} LN(--)$$

1ST P1/3 TEST TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00015929 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 24.00 \* 2.31 = 145.32
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MINK = .00000004 CM/SEC

2ND P1/3 TEST TEST

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 108.00 - 117.65
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

$$K = ----- LN(--)$$
  
2 (PI) (L) (H) R

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00026065 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 26.00 \* 2.31 = 149.94
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .000000012 FT/MIN K = .00000006 CM/SEC

2ND P1/3 TEST

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 115.65 - 125.30
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00175214 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS BELOW WATER TABLE
HEAD = DEPTH TO WATER + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.98 + 5.90 + 28.00 \* 2.31 = 154.56
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN K = .00000039 CM/SEC

2ND P1/3 TEST

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02 DATE TESTED: 11/11/87 BY: KD HOLLIWAY TEST INTERVAL (FEET BELOW G.S.): 122.68 - 132.33

MATERIAL TESTED: ARAPAHOE SANDSTONE DEPTH TO WATER (FEET BELOW G.S.): 83.98

> K = ----- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 10.15 + .00 \* 2.31 = 94.13

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 29.70 \* 2.31 = 158.49

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

2ND P1/3 TEST

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3987	11/12/87	5947.10	5949.12	2.02	117.14	23.90	5925.22
	12/22/87					23.60	5925.52
	02/01/88					40.20	5908.92
	02/29/88					46.60	5902.52
	03/21/88					108.6	5840.52
	04/18/88					86.00	5863.12

SATURATED THICKNESS IN WELL # 39-87(SP) <u>G</u>~ Oct-87 Jan-88 Apr-88 Jul-87 Jan-87 Apr-87 DATE Oct-86 Apr-86 Jul-86 Jan-86 90 80 -30 20 -100 2 80 20 404 5 O

SATURATED THICKNESS (ft.)

## INDEX OF DATA

Boring No.: 56-87 /SP16-87		
Completed as well? Yes		
Data in File		
X Log of Borehole		
X Well Construction Summaries		
X Well Development Summaries		
Hydraulic Conductivity Test Data and Results		
Packer Test Data and Results		
X Water Level Data		
X Saturated Thickness Hydrographs		

Coordinate Total Depth Drilling Cor	N 37654.23 E 21319.10 Ground Surface  13.40' Water Level E  supperson Boyles Bros. Driller T. High January 7, 1988 Helper B. Keel thod Hollow Stem Auger Drilling Fluid	ney None
0	Lithologic Description	Samples Collected or Other Tests Performed
	TOP SOIL  O.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100%. O.0-0.5': TOP SOIL: varied greens and browns; grass and ice; subangular; cobbles up to 1" diameter; sandy clay; frozen.	HNu background=1.2. OVA Bachground=1.6 Ludlum background = 0.0
<u>5</u>	ARTIFICIAL FILL/DISTURBED  0.5-1.1': CLAYEY SAND: pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2); very coarse-grained (2.0-1.5 Ø to 1/4"), poorly sorted sand;	readings: HNu = 1.2 (1.2); OVA = 1.9 (1.2). <u>0.0-2.0'</u> : Field screen sample: SP168702FS.
_10	subrounded to angular; small quartzite gravel up to 1" diameter; unconsolidated; moist to frozen.  1.1-2.0': SANDY CLAY: moderate brown (5 YR 3/4); some very coarse-grained, poorly sorted, subrounded to angular sand; angular quartzite gravel up to 3"	2.0-3.5': Field screen readings: HNu = 1.2 (1.2); OVA = 1.2 (1.2).  4.0-6.0': Field screen readings: HNu = 1.6 (1.6); OVA = 1.2 (1.2).
<u>.15</u>	diameter; varied green to yellow red orange to red staining throughout core; damp.	6.0-8.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0).  6.0-8.0': Upper contact sample:
		SP168708UC.  10.0-11.2': Contact sample:SP168710CT  11.2-13.4': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0)

		Plant; Solar Pond Area		No. <u>56-87/SP16-87 (cont'c</u> Elevation <u>5978.51'</u>		
Total Depth	13.40'		Water Level Encountered None			
				tatic		
Drilling Com	pany Boy	les Bros.	Driller T. Hig	.h		
Date Drilled				eney		
		w Stem Auger				
	· · · · · · · · · · · · · · · · · · ·		Drilling Fluid	None		
Logged By	KD Hol	liway Dologist	Checked By	Site Manager		
		50.0 <b>5</b> .01		olto manager		
			*****	CEARP Manager		
Comments .						
•				· · · · · · · · · · · · · · · · · · ·		
		Lithologic De	scription	Samples Collected or Other Tests Performed		
†	· †	2.0-4.0' SAMPLE.		11.2-13.4': Bedrock		
1		Recovered $1.5/2.0' = 75$		Sample: SP168711BR		
T	T	CLAYEY SAND AND		Sumple: SI 100/112K		
1	.	brown (5 YR 5/6) w				
1		orange (10 YR 8/6) a orange (10 YR 6/6) w				
+	- +	reddish brown (10 Y				
1		sand zones; very coa				
t	- +	sorted sand, subang				
1	_ 1	quartzite gravel suban				
		3" diameter; becomes	sandier down core			
+	- +	with medium-grained				
		sorted, subangular sand	d; damp.			
+	• +	+ 10 60 01 01		·		
		$\frac{4.0-6.0' \text{ SAMPLE.}}{\text{Recovered } 2.0/2.0' = 10}$	) n <i>o</i> z			
T	T	SANDY CLAY: m				
- +	- ∔	brown (10 YR 5/4)				
		brown (10 YR 4/2) w				
+	+ +	+ gray (5 Y 7/2) especia	ally towards bottom			
	.	of core; subangular to				
1		gravel up to 2" diame				
4	+ +	core; quartzitic sand				
		rounded to subangul (2.0-1.5 Ø) to coarse-				
4	+	diameter; poorly sort		}		
		some caliche increase				
_ 1		to moist.	, uamp	1		
	+	+				
4	+	†				
•	†	T				
		$\perp$				
7	l T					

# OF BOREHOLE

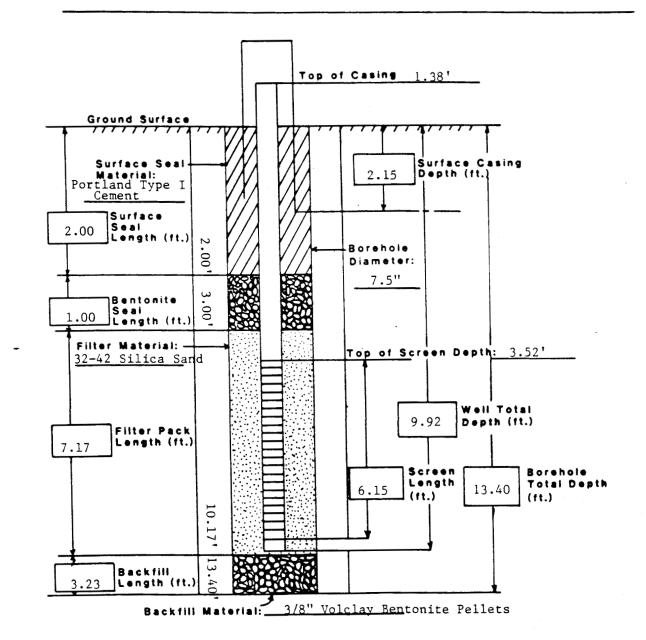
Coordinates Total Depth Drilling Com Date Drilled Drilling Meth	N 37654.23 E 21319.10  13.40'  Pany Boyles Bros.  January 7, 1988  Mel Hollow Stem Auger  Drill	ehole/Well No. 56-87/SP16-87 (contident of the static of t
	Lithologic Description	Samples Collected or Other Tests Performed
	6.0-8.0' SAMPLE. Recovered 2.0/2.0' = 100%. 6.0-6.3':GRAVEL: angular to be fine-grained sand; dry. 6.3-7.0': CLAYEY SAND: dusk Y 6/4) to yellowish gray (5 Y clay; sand is very fine-grained grained (2.5-2.0 Ø); fairly wanconsolidated; some calicate reaction to HCl); damp to mois 7.00-8.00': CLAYEY SANGRAVEL: yellowish gray (5 Y light brown (5 YR 5/6) and reddish brown (10 R 4/6) state grained (2.5-2.0 Ø) to coapoorly sorted, subrounded to sand; subangular gravel; lots unconsolidated; moist.	y yellow (5 7/2); some ed to fine- vell sorted; he (strong it. ND AND Y 7/2) with d moderate ining; fine- rse-grained, subangular
	8.0-10.0' SAMPLE. Recovered 0.0/2.0' = 0%. Lost core.  ARAPAHOE FORMAT  Q/Ka contact estimated addrilling and cuttings.  10.0-11.2' SAMPLE. Recovered 1.8/1.2' = 150%. SANDY CLAYSTONE: light of y 5/2) to yellowish gray (5 dark yellowish orange (10 Yestaining; very fine-grained grained sand; some caliche; of damp.	olive gray (5 Y 7/2) with R 6/6) iron to fine-

Total Depth 13,40' Water Level Encountered None 13,40' Water Level Encountered None State 11,140' Water Level E		Rocky Flats Plant; Solar		No. <u>56-87/SP16-87 (contid</u>		
Drilling Company Boyles Bros.  Driller T. High  Date Drilled January 7, 1988  Drilling Method Hollow Stem Auger  Drilling Field None  Checked By  Geologist  CEARP Manager  CEARP Manager  Cithologic Description  T. High  None  CEARP Manager  CEARP Manager  CEARP Manager  CEARP Manager  Samples Cellected or Other Yests Performed  The property of the						
Drilling Company Boyles Bros.  Date Drilled January 7, 1988  Drilling Method Hollow Stem Auger  Logged By KD Holliway  Geologist  Checked By  Clarp Manager  Campents  Lithologic Description  T. High  None  Checked By  Site Manager  CEARP Manager  City To the Tests Performed  The Total Performed  Samples Collected or Other Tests Performed  The Tests Performed  Samples Collected or Other Tests Performed  Annual Collected or Other Tests Performed  Samples Collected or Other Tests Performed	Total Depti	h <u>13.40'</u>	Water Level	Encountered None		
Date Drilling Method Hollow Stem Auger  Logged By KD Holliway  Geologist  CEARP Manager  Cearp Manager  Lithologic Description  Lithologic Description  Lithologic Description  Lithologic Description  Samples Collected or Other Tests Performed  Recovered 2.2/2.2' = 100%. SANDY CLAYSTONE: same as above with occasional iron nodules.						
Comments    Comments						
Comments    Clark Manager   Clark Manager   Clark Manager						
Comments  CEARP Manager  CEARP Manager  CEARP Manager  CEARP Manager  City Manager  Cearp Manager  Cearp Manager  Samples Cellected or Other Tests Performed  11.2-13.4' SAMPLE.  Recovered 2.2/2.2' = 100%.  SANDY CLAYSTONE: same as above with occasional iron nodules.			Drilling Fluid			
CEARP Manager  Samples Collected or Other Tests Performed  11.2-13.4' SAMPLE. Recovered 2.2/2.2' = 100%. SANDY CLAYSTONE: same as above with occasional iron nodules.	Logged By	Logged By KD Holliway				
Lithologic Description  Samples Collected or Other Tests Performed  11.2-13.4' SAMPLE. Recovered 2.2/2.2' = 100%. SANDY CLAYSTONE: same as above with occasional iron nodules.		Geologist				
11.2-13.4' SAMPLE.  Recovered 2.2/2.2' = 100%.  SANDY CLAYSTONE: same as above with occasional iron nodules.	Comments			CEARP Manager		
11.2-13.4' SAMPLE.  Recovered 2.2/2.2' = 100%.  SANDY CLAYSTONE: same as above with occasional iron nodules.						
11.2-13.4' SAMPLE.  Recovered 2.2/2.2' = 100%.  SANDY CLAYSTONE: same as above with occasional iron nodules.		Lit	hologic Description	Samples Collected or Other Tests Performed		
Recovered 2.2/2.2' = 100%.  SANDY CLAYSTONE: same as above with occasional iron nodules.						
Recovered 2.2/2.2' = 100%.  SANDY CLAYSTONE: same as above with occasional iron nodules.		+ + + 11 2-13 4' \$4	MPI F			
with occasional iron nodules.						
† † †		†	LAYSTONE: same as above			
TOTAL DEPTH: 13.40'.		with occasion	onal iron nodules.			
			OTAL DEPTH: 1340'			
		† † † · · · · · · · · · · · · · · · · ·	51112 DDI 111. 13.49 .			
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#### WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area Well No. \_ 56-87/SP16-87 Coordinates N 37654.23 E 21319.10 Elevation: Ground Surface \_5978.51' Total Depth: Well 9.92' Borehole 13.40' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, Type 316, TFJ Stainless Casing Diameter \_2" ID Screen Material 0.010" wire wrap. Type 316, TFJ

Date Installed January 8, 1987 Stainless Steel Surface Casing Diameter \_\_5" ID Date installed January 8, 1987 Approved By \_ installed By K.D. Holliway Geologist Site Manager **CEARP Manager** Comments .



# WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
1/14/88	0800	Pumping			Water level 0' before pumping; Water level 0' after pumping.
1774700	0300	r-diiip i iig			Hole depth: 10.3'
			•		
				·	
	-				
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# ROCKY FLATS SOLAR PONDS

## WATER LEVEL SUMMARY

		GROUND	TOP OF		DEPTH	WATER	WATER
WELL		SURFACE	CASING	STICK	OF SI	DEPTH	SURFACE
NUMBER	DATE	ELEVATION	ELEVATION	UP	BASE	BELOW TOC	ELEVATION
5687	02/29/88	5978.51	5979.89	1.38	9.67	6.70	5973.19
	03/21/88					7.80	5972.09
	04/18/88					6.70	5 <b>973.</b> 19

56-87 (SP) G-8-60 Jan-88 Apr-88 Oct-87 SATURATED THICKNESS IN WELL # Jul-87 Apr-87 DATE Jan-87 Oct-86 Jul-86 Apr-86 Jan-86 80 -60 30 50 20 -90 100 Ö 70 404 Ó

SATURATED THICKNESS (ft.)

APPENDIX B-3
1987 BOREHOLES

#### INDEX OF DATA

Boring No.: SP01-87		
Completed as well? No		
Data in File		
X Log of Borehole		
Well Construction Summaries		
Well Development Summaries		
Hydraulic Conductivity Test Data and Results		
Packer Test Data and Results		
Water Level Data		
Saturated Thickness Hydrographs		

Coordinates * N 37792 E 2 Total Depth 30.2'  Drilling Company Boyles Br. Date Drilled October 27-28, Drilling Method Hollow Stem Logged By J. Bacchus  Geologist  *Coordinates and	OS. Driller R. S  1987 Helper T. M  Auger Drilling Fluid  Checked By	Elevation *5982.7' Encountered 15.2' Static harp erritt None Site Manager CEARP Manager
	Lithologic Description	Samples Collected of Other Tests Perform
Recove 0-0.6' 5/4); 2.0-4. Recove CLAY: origin  4.0-5. Recove 4.0-4. 4.1-4. 4.35-5. large  5.0-8. Recove 7.7-8. 4/6); 8.0-10 Recove SAND: small  10.5- Recove SAND: small  12.7- Recove 12.7-	O' SAMPLE.  Pred 1.2/2.0' = 60%.  SAND: moderate yellowish brown (10 YR silt and clay, asphalt; slight HCl reaction.  2': CLAY: moderate yellowish brown (10 YR dense; large pebbles; caliche; dry.  O' SAMPLE.  Pred 2.0/2.0' = 100%.  dense; large angular clasts of igneous n; reacts with HCl; slightly moist.  O' SAMPLE.  Pred 1.2/1.0' = 120%.  1': CLAY: same as above.  35': layer of asphalt  5.0': CLAY: same as layer above except one chunk of redwood; appears to be a stake.  O' SAMPLE.  Pred 1.3/3.0' = 43%.  7': CLAY: moderate yellowish brown (10 YR with some spots of dark yellowish orange (10 /6); sandy; silty; pebbly; clasts are gular to highly angular; dry.  O': CLAY: moderate reddish brown (10 YR some coarse sand; slightly moist.  D.5' SAMPLE.  Pred 2.0/2.5' = 80%.  1': CLAY: same as above.  1.0': SAND: moderate yellowish brown (10 YR some coarse sand; slightly moist.  D.5' SAMPLE.  Pred 2.0/2.5' = 80%.  1': CLAY: same as above.  1.0': SAND: moderate yellowish brown (10 YR some coarse sand; slightly moist.  D.5' SAMPLE.  Pred 1.65/2.5' = 66%.  Same as above; contains some subrounded cobbles; dry.  15.2' SAMPLE.  Pred 1.2/2.5' = 48%.  13.2': SAND: moderate reddish brown (10 YR conglomeratic sand; poorly sorted; silt;	OVA Background=1.0 Ludlum Background=0.0  No Ludlum readings above background  0.0-1.2': Field Screen Reading: HNu=0.4(0.4); OVA=1.2(0.6).  0.0-1.2': Field Screen Sample: SP018700FS.  4.0-5.0': Reading on Core: HNu=1.4; OVA=1.2.  4.0-5.0': Direct Hit Sample: SP018704DH.  5.0-6.3': Reading on Core: HNu=3.4; OVA=1.2.  5.0-6.3': Direct Hit Sample: SP018705DH.  8.0-10.0': Readings on Core: HNu=3.4; OVA=1.2.  10.5': Readings in Breathing Zone: HNu=0.6; OVA=2.5.  10.5-12.2': Readings on Core: HNu=1.0; OVA=2.8.  10.5-12.2': Direct Hit/Upper Contact Sample: SP 018711DH.  12.7-13.9': Readings on

Coordinates  Fotal Depth  Drilling Company Date Drilled  Drilling Method  Logged By  Geologist	Water Level Encountered  Static  Driller  Helper  Drilling Fluid		
	Lithologic Description	Samples Collected o Other Tests Performs	
20	ARAPAHOE FORMATION		
Clean (10 Y slight   15.2- Recov. SANDS yello last   17.7- Recov. 17.7- Yery   17.9- yello (10 Y dry. 18.9- highly 6/6); coars.   20.2- Recov. SANDS yello conso   22.7- Recov. SANDS yello conso   25.2- Recov. SANDS yello conso   25.2- Recov. 25.2- YR 6/7 25.9- YR	13.9': SANDSTONE: yellowish gray (5 Y 7/2); ; mottled oxidation; dark yellowish orange R 6/6); well sorted, small amount of clay; tly moist.  17.7' SAMPLE. ered 1.5/2.5' = 60%.  TONE: moderate yellowish brown (10 YR 5/4) to wish gray (5 Y 7/2); claystone soaked except 0.15 ft where it is wet to moist.  20.2' SAMPLE. ered 2.35/2.5' = 94%. 17.9': CLAYSTONE: light olive gray (5 Y 5/2); fissile; no sand; moist. 18.9': SANDSTONE: alternating bands of wish gray (5 Y 7/2) and dark yellowish orange R 6/6); coarse-grained; subrounded; moist to 20.05': SANDSTONE: yellowish gray (5 Y 7/2); y stained with dark yellowish orange (10 YR fractures; well consolidated; fine to e-grained; no HCl reaction; moist.  22.7' SAMPLE. ered 2.1/2.5' = 84%. TONE: same as above.  25.2' SAMPLE. ered 2.1/2.5' = 84%. TONE: dark yellowish orange (10 YR 6/6) and wish gray (5 Y 7/2); fine-grained; well lidated; slightly moist.  27.7' SAMPLE. ered 2.4/2.5' = 96%. 25.9': CLAYSTONE: dark yellowish orange (10 And yellowish gray (5 Y 7/2); sand; dry. 27.6': SANDSTONE: dark yellowish orange (10 And yellowish gray (5 Y 7/2); sand; dry. 27.6': SANDSTONE: dark yellowish orange (10 And yellowish gray (5 Y 7/2); coarseded; dry.	12.7-14.9': Direct Hit/Contact Sample: SP018713DH.  15.2-16.7': Readings on Core: HNu=2.1; OVA=10.0.  15.2-16.7': Bedrock Sample: SP018716BR.  20.2-22.3': Readings on Core: HNu=2.3; OVA=1.8.  20.2-22.3': Direct Hit Sample: SP018721DH.  22.7-24.8': Readings on Core: HNu=0.2; OVA=4.3.  22.7-24.8': Direct Hit Sample: SP018723DH.  25.2-27.6': Readings on Core: HNu = 0.3; OVA = 0.6.  27.7-30.2': Readings on Core: HNu = 0.3; OVA = 0.6.	
, , , ,	ered 2.65/2.5' = 120%.  TONE: same as above except sand is finered.  TOTAL DEPTH: 30.2'.		

## INDEX OF DATA

Boring No.: SP02-87				
Completed as well? No				
Data in File				
X Log of Borehole				
Well Construction Summaries				
Well Development Summaries				
Hydraulic Conductivity Test Data and Results				
Packer Test Data and Results				
Water Level Data				
Saturated Thickness Hydrographs				

Coordinates * N 37980 E 21532  Total Depth 15.1'  Drilling Company Boyles Bros.  Date Drilled October 29, 1987  Drilling Method Hollow Stem Auger  Logged By J. Bacchus  Geologist	Borehole/Well No. SP02-87  Ground Surface Elevation *5976.6'  Water Level Encountered None Static  Driller R. Sharp  Helper T. Merritt  Drilling Fluid None  Checked By  Site Manager
Comments Borehole backfilled with Portland 1 *Coordinates and elevation estimates  Lithologic Desc	Type I Cement. ed from topographic map.  Samples Cellected or
ARTIFICIAL FILL/DISTANT AND AND AND AND AND AND AND AND AND AND	HNu Background=0.9  OVA Background = 0.5-5.0  Ludlum Background = 0.0  No readings above background  O.0-10.1': Composite Sample: SP02870008. (VOAs taken at 7.6-10.1).  7.6-10.1': Upper Contact Sample: SP028708UC.  Readjust depth.  Readjust depth.  10.1-12.6': Contact Sample: SP028711CT.  12.6-15.1': Bedrock sample: SP028713BR.
ARAPAHOE FORMA  10.1-12.6' SAMPLE. Recovered 2.6/2.5' = 104%. SANDSTONE: yellowish gray (5 Y light yellowish orange; fine sand; caliche; coal; turns gre HCl; dry.  12.6-15 .1' SAMPLE. Recovered 2.7/2.5 = 108%. SANDSTONE: same as above of light yellowish orange; the slightly moist near the bottom  TOTAL DEPTH: 15	7/2) with bands of to coarse-grained en with contact with except mottled with sand is coarser;

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: 💇
Completed as well? No
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Saturated Thickness Hydrographs

	coles Diseas			
		Plant; Solar Ponds Area		
		E 21532		Elevation *5978.7'
Total Depti	h <u>20.4'</u>			incountered 12.81
<b>.</b>		_		Static
		les Bros.		ırp
		1 and 26. 1987		ritt
		w Stem Auger		None
Logged By	J. Bacchus	ologist	Checked By _	Site Manager
	G⊕	ologist		Site Manager
			-	CEARP Manager
Comments	Borehole ba	ackfilled with Portland	i Type I Cement.	
	*Coordinate	es and elevation estima	ated from topogra	phic map.
	7. 7			
/3		• /		Samples Collected or
		Lithologic De	scription	Other Tests Performe
	/6 4/67	/		
— 0 <b>-</b>				
	F0=1/	ARTIFICIAL FILL/	DISTURBED	
		0-2.0' SAMPLE.		
•		Recovered 1.75/2.0' = 86%. SOIL: dark yellowish brown (	(10 YR 4/2); roots in	HNu Background=0.4
	[ ]	the upper 0.4 ft: sizes rand	ge from clay to small	OVA Background = 0.0-2.2
•	国籍 /	cobbles; clasts are very ang in any order; very poorly son	utar and not oriented ted: dry.	Ludium Background = 0.0
		L		2.0-3.51: Reading on
		ROCKY FLATS AI	LLUVIUM	Core: HNu=2.0; .OVA=20.
<del></del> 5		2.0-4.0' SAMPLE. Recovered 1.5/2.0' = 75%.		2.0-3.51: Direct Hit Sample: SP038702DH.
		2.0-3.11: CLAY: same as above	<b>2.</b>	Sample: SP030702DH.
	T /	3.1-3.51: CLAY: same as ab clay; grayish black (N 2/0);	ove except much more	4.01: Reading in Augers: HNu=4: OVA=39.
	<b>↓                                    </b>	+	morac.	
		4.0-5.0' SAMPLE. Recovered 0.6/1.0' = 60%.		4.0-4.61: Field Screen Sample: SP038703FS (VOAs
	†	CLAY: same as above exce	pt a large quartzite	
		cobble.		10.3-11.6': Readings on
		5.0-8.0' SAMPLE.		Core: HNU=0.3; OVA=3.6.
<del></del> 10	+ <b>/</b> /	Recovered 1.85/3.0' = 62%. 5.0-5.7': CLAY: dusky red (	(5 R 3/4); some sand,	10.3-11.61: Direct
		pebbles to 2.5" diameter;		Hit/Upper Contact Sample: SP038711DH.
	<b>†</b> /	rounded to angular; moist. 5.7-6.85': SAND: moderate y	ellowish brown (10 YR	
	<b>4 4</b> ,	5/4); small cobbles and cl rounded to angular; no HCl r		12.8-14.41: Readings on Core: HNu=0.3: OVA=2.6.
			eaction.	
	المنتقل ا	8.0-10.5' SAMPLE. Recovered 1.1/2.5' = 44%.		
		SAND: moderate yellowish	brown (10 YR 5/4);	1
	[[]]	mottled with very pale oran sand; large quartzite clast	age (10 YR 8/2); silty is that are subrounded	
<del></del> 15	<b>接到</b>	to angular; high amount of		
-3		sorted, dry.		
	<b>国国</b> /	10.5-12.8' SAMPLE.		
		Recovered 1.3/2.5' = 52%.  SAND: moderate yellowish bro		1
	[ ]	sorted; quartzite clasts the small cobbles to large peb		1
		little clay; no HCl reaction		
		†	•	
		1		;

Coordinates Ground Surfa  Fotal Depth Water Level  Drilling Company Driller Helper	Static  Site Manager  CEARP Manager
Lithologic Description	Samples Collected o Other Tests Performs
12.8-15.2' SAMPLE.  Recovered 1.6/2.5' = 64%.  12.8-13.2': GRAVEL: moderate yellowish brown (10 YR 5/4); very poorly sorted; clasts are highly angular; clay, silt and sand; saturated; encountered water table at the top of the run.  ARAPAHOE FORMATION  13.2-14.4':CLAYSTONE: light olive gray (5 YR 3/2) mottled light brown (5 YR 5/6); dense; pockets or caliche; semi-moist to dry	Sample: SP038713CT.
15.2-17.7' SAMPLE.  Recovered 1.7/2.5' = 68%.  CLAYSTONE: same as above except getting sand near the bottom of the run.  Total depth with plopper 17.9'.  Adjust depth.  17.9-20.4' SAMPLE.  Recovered 1.8/2.5' = 72%. 17.9-18.0': CLAYSTONE: light olive gray (5 Y 5/2) stained light brown (5 YR 5/6); dense; no HC reaction; moist to wet.  18.0-19.7': SILTSTONE: dark yellowish orange (1 YR 6/6); some coarse-grained sand clasts; pocket of caliche; dry.  TOTAL DEPTH: 20.4'.	15.2-16.9': Bedrock Sample: SP038716BR. 17.9-19.7': Readings on Core: HNu=0.3; OVA=2.6.
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Packer Test Data and Results		
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Saturated Thickness Hydrographs		

Location Rocky Flats Plant; Solar Ponds Area	Borehole/Well No. SP04-87
<del>-</del>	Ground Surface Elevation *5971.8'
Total Depth 37.0'	Water Level Encountered 12.01
	Static
Drilling Company Boyles Bros.	Driller R. Sharp
Date Drilled October 30 and November 3 and 4,	Helper T. Merritt
Drilling Method Hollow Stem Auger 1987	
	Drilling Fluid None
Logged By J. Bacchus Geologist	Checked By Site Manager
	one meneger
	CEARP Manager
Comments Borehole backfilled with Portland Ty	ype I Cement.
*Coordinates and elevation estimated	i from topographic map.
Lithologic Descri	Samples Collected or
Lithologic Descri	
<u>/                                    </u>	
ARTIFICIAL FILL/DIST	URBED HNu Background = 0.4-0.5
	OVA Background = 0.6-3.6
0.0-2.0' SAMPLE. Recovered 1.2/2.0' = 60%.	No Ludlum readings taken
0-0.0.3': PEBBLE: large. 0.3-0.9': CLAY: moderate yellow	$\frac{2.0-3.7'}{1.00}$ : Readings on Core: HNu = 15; OVA =
5/4); sand; silt and pebbles; c	clasts are angular   0.4.
to subrounded; slight reaction to 0.9·1.2': IGNEOUS ROCK: some frac	o HCl; moist. ctures. 2.0-3.7': Direct Hit
120Ct 1	Sample: SP048702DH.
2.0-4.0' SAMPLE.  Recovered 1.7/2.0' = 85%.	4.0-5.8': Reading on
GRAVEL: dusky brown (5 YR 2/2	2); cobbles to 4   Core: HNu=400: OVA=0.2.
inches in diameter, held togeth HCl reaction; moist.	4.0-5.8': Direct Hit
4.0-7.0' SAMPLE.	Sample: SP048704DH.
Recovered 1.8/3.0' = 60%.	4.0-5.81: Duplicate
4.0-4.8': GRAVEL: same as above. 4.8-5.8': CALICHE; very pale or	
silt; small angular cobbles simi	ilar to the clasts 7.0': Readings in
above; dry.	Breathing Zone: HNu=1.2; OVA=1.0.
7.0-9.5' SAMPLE. Recovered 1.7/2.5' = 68%.	7.0.0.51. 0a-di
7.0-8.3': CALICHE: same as above	
8.3-8.7': GRAVEL: with caliche, above; dry; spotted with moist a	
	Hit/Upper Contact Sample:
ARAPAHOE FORMATI	SP048707DH.
9.5-12.0' SAMPLE.  Recovered 0.6/2.5' = 24%.	10.51: Readings in
SANDSTONE: yellowish gray (5 Y 7	
pebbles; grains are rounded to s grained; some clay; very moist.	· 1
	9.5-11.1': Readings on Core: HNu=20; OVA=7.8.
15 12.0-14.5' SAMPLE. Recovered 2.9/2.5' = 116%.	9.5-11.1': Direct
12.0-12.2': GRAVEL: moderate ye	ellowish brown (10   Hit/Contact Sample:
YR 5/4); come clay and sand; wet 12.2-14.5': CLAYSTONE: light (	
5/2); mottled with dark yellow 6/6); moist.	ish orange (10 YR   12.0-14.51: Readings on
Tolon, moist.	Core: HNu=85; OVA=3.3.
	12.0-14.5': Direct
	Hit/Water Table/ Bedrock Sample:
	SP048712DH.

Lithologic Description    14.5-17.0  SAMPLE.   Recovered 2.7/2.5  = 108%.   14.5-15.1 : CLAYSTONE: Light olive gray (5 Y 5/2)   stained with dark yellowish orange (10 YR 6/6); blocky structure, concretions of caliche; moist.   15.1-17.0 : Same as above; wet.   17.0-19.5  SAMPLE.   Recovered 2.6/2.5  = 104%.   17.0-19.5  sightly moist.   18.3-19.5 : CLAYSTONE: dark yellowish orange (10 YR 6/6); very stightly moist.   18.3-19.5 : CLAYSTONE: olive gray (5 Y 3/2)   mottled with dark yellowish orange (10 YR 6/6); very stightly moist.   19.5-22.0  SAMPLE.   Recovered 2.6/2.5  = 104%.   CLAYSTONE: same as above.   17.0-19.5 : Sample: SPO   17.0-19.5 : Sample: SPO   19.5-22.0 : SAMPLE.   Recovered 2.5/2.5  = 100%.   19.5-22.0 : Sample: SPO   19	-87(cont'd.) on od
14.5-17.0¹ SAMPLE.  Recovered 2.7/2.5¹ = 108%.  14.5-15.1¹: CLAYSTONE: light olive gray (5 Y 5/2) stained with dark yellowish orange (10 YR 6/6); blocky structure, concretions of caliche; moist.  15.1-17.0¹: Same as above; wet.  17.0-19.5¹ SAMPLE.  Recovered 2.6/2.5¹ = 104%.  17.0-17.2¹: CLAYSTONE: same as above.  17.2-18.3¹: CLAYSTONE: dark yellowish orange (10 YR 6/6); slightly moist.  18.3-19.5¹: CLAYSTONE: olive gray (5 Y 3/2) mottled with dark yellowish orange (10 YR 6/6); very slightly moist.  19.5-22.0¹ SAMPLE.  Recovered 2.6/2.5¹ = 104%.  CLAYSTONE: same as above.  19.5-22.0¹ SAMPLE.  Recovered 2.5/2.5¹ = 100%.  CLAYSTONE: same as above except a little more sand.  24.5-27.0¹ SAMPLE.  Recovered 2.5/2.5¹ = 100%.  CLAYSTONE: same as above except a little more sand.  24.5-27.0¹ SAMPLE.  Recovered 2.5/2.5¹ = 100%.  CLAYSTONE: same as above except less sand, more consolidated and dry.  25.0-27.0¹: CLAYSTONE: olive gray (5 Y 2/2); some	EARP Manager
14.5-17.0¹ SAMPLE. Recovered 2.7/2.5¹ = 108%. 14.5-15.1¹: CLAYSTONE: light olive gray (5 Y 5/2) stained with dark yellowish orange (10 YR 6/6); blocky structure, concretions of caliche; moist. 15.1·17.0¹: Same as above; wet.  17.0·19.5¹ SAMPLE. Recovered 2.6/2.5¹ = 104%. 17.0·17.2¹: CLAYSTONE: same as above. 17.2·18.3¹: CLAYSTONE: dark yellowish orange (10 YR 6/6); slightly moist. 18.3·19.5¹: CLAYSTONE: olive gray (5 Y 3/2) mottled with dark yellowish orange (10 YR 6/6); very slightly moist.  19.5·22.0¹ SAMPLE. Recovered 2.6/2.5¹ = 104%. CLAYSTONE: same as above.  22.0·24.5¹ SAMPLE. Recovered 2.5/2.5¹ = 100%. CLAYSTONE: same as above except a little more sand.  24.5·27.0¹ SAMPLE. Recovered 2.5/2.5¹ = 100%. CLAYSTONE: same as above except a little more sand.  24.5·27.0¹ SAMPLE. Recovered 2.5/2.5¹ = 100%. CLAYSTONE: same as above except less sand, more consolidated and dry. 25.0·27.0¹: CLAYSTONE: olive gray (5 Y 2/2); some	les Collected e Tests Perform
27.0-29.5' SAMPLE. Recovered 2.5/2.5' = 100%.  CLAYSTONE: same as above except layers of oxidation from 0.2 to 0.4 ft in thickness; dark yellowish orange (10 YR 6/6); grades from pure claystone at the top to very sandy claystone at the bottom; pockets of caliche in unweathered areas; dry.  29.5-32.0' SAMPLE. Recovered 2.7/2.5' = 108%. CLAYSTONE: same as above except much more sandy; dry.  Core: HNu=4:  24.5-27.0': Sample: SPO  27.0-29.5': Sample: SPO  27.0-29.5': Sample: SPO  27.0-29.5': Core: HNu=4:  24.5-27.0': Sample: SPO  27.0-29.5': Core: HNu=4:  27.0-2	1: Field Screen P048715FS  1: Readings on =45; OVA=3.2.  1: Direct Hit P048717DH.  1: Readings on =60; OVA=3.0.  1: Direct Hit P048720DH.  1: Readings on = 450; OVA =  1: Direct Hit P048722DH.  1: Readings on =45; OVA=3.0.  1: Direct Hit P048725DH.  1: Readings on =40; OVA=5.8.  1: Direct Hit P048727DH.  1: Readings on =4.0; OVA=5.8.  1: Direct Hit P048727DH.  1: Readings on =60.0; OVA=5.4.  1: Direct Hit P048727DH.

Coordinates  Cotal Depth  Drilling Company  Date Drilled  Drilling Method  Logged By	Driller Helper Drilling Fluid	Site Manager  CEARP Manager
Comments		
	Lithologic Description	Samples Collected o Other Tests Performs
	32.0-34.5' SAMPLE.  Recovered 2.7/2.5' = 108%.  CLAYSTONE: dark yellowish orange (10 YR 6/6 mottled with grayish orange pink (5 YR 7/2); ver thin seams of coal; no HCl reaction; weathered slightly moist.  34.5-37.0' SAMPLE.  Recovered 2.5/2.5' = 100%.  CLAYSTONE: olive gray (5 Y 3/2) mottled with dar yellowish orange (10 YR 6/6); sandy; contains som coal; dry.  TOTAL DEPTH: 37.0'.	32.0-34.5': Direct Hit Sample: SP048732DH.  34.5-37.0': Readings on Core: HNu=0.0; OVA=0.5.

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Completed as well? No		
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Well Construction Summaries		
Well Development Summaries		
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Packer Test Data and Results		
Water Level Data		
Saturated Thickness Hydrographs		

Drilling Company Boyles Bros.  Date Drilling Method Hollow Stem Auger  Water Level E  State Printing Method Hollow Stem Auger  Drilling Fluid	Elevation *5971.6' incountered 15.3'  Static arp rritt; S. Bradfield
Comments Borehole backfilled with Portland Type I Cement.  *Coordinates and elevation estimated from topographics.	
	onic map.
Lithologic Description	Samples Collected or Other Tests Performed
0.0-2.0' SAMPLE. Recovered 0.4/2.0' = 20%.	HNu Background=1.2 OVA Background=0.8 No Ludlum readings taken
SOIL: moderate yellowish brown (10 YR 5/4); roots; sand; clay; silt; dry.  ARTIFICIAL FILL/DISTURBED	0.0-0.4': Readings on Core: HNu = 1.0; OVA = 1.2.
2.0-4.0' SAMPLE.  Recovered 1.3/2.0' = 65%.  GRAVEL: dusky yellowish brown (10 YR 2/2) small cobbles; pebbles; sand, silt, and clay; angular	
particles; wet to moist.  4.0-7.0' SAMPLE.  Recovered 1.6/3.0' = 53%.  4.0-4.7': GRAVEL: same as above.	2.0-3.3': Reading on Core: HNu=0.8; OVA=11.  2.0-3.3': Direct Hit Sample: SP058702DH.
4.7·7.0¹: CLAY: dark reddish brown (10 R 3/4); some sand and small angular cobbles; dense; dry.  7.0·9.5¹ SAMPLE.	4.0-5.61: Readings on Core: HNu=0.8; OVA=4.8.
Recovered 1.3/2.5' = 52%.  SAND: very pale orange (10 YR 8/2) and dark yellowish orange (10 YR 6/6); sand, silt, and cobbles; high amount of caliche; poorly sorted; dry.	i i
9.5-12.0' SAMPLE. Recovered 1.1/2.5' = 44%. SAND: same as above except slightly moist near	7.0-8.31: Direct Hit Sample: SP0587070H.
the bottom.  Total depth of borehole measured 12.8'; adjust depth.	9.5-10.6': Readings on Core: HNu=3.0; OVA=4.8.  9.5-10.6': Direct Hit Sample: SP0587100H.
12.8-15.3' SAMPLE.  Recovered 1.6/2.5' = 64%.  SAND: light olive gray (5 Y 5/2); small cobbles; pebbles; silt; clay clasts are angular; slight HCl	12.8-14.4': Readings on Core: HNu=2.2; OVA=2.8.
reaction; wet on top 0.3 ft; moist in the rest of the run.	12.8-14.41: Direct Hit Sample: SP058712DH. 15.3-17.31: Readings on
Recovered 2.0/2.0' = 100%. 15.3-16.3': GRAVEL: same as above except less sand; strong HCl reaction; very wet.	Core: HNU=1.0; OVA=2.8.

ARAPANCE FORMATION  17.8-19.8' SAMPLE. Recovered 2.2/2.0' = 110X. CLYSTONE: dasky yellow (5 Y 6/4) to light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 Y 6/6); blocky structure; no HCl reaction; moist to wet.  10.8-21.8' SAMPLE. Recovered 2.2/2.0' = 110X. CLAYSTONE: Same as above except small pockets of caliche; moist.  TOTAL DEPTH: 21.8'.	Coordinates Total Depth  Drilling Company Date Drilled Drilling Method Logged By  Ge	Ground Surface Water Level E  Driller Helper Drilling Fluid Checked By	No. SP05-87(cont'd.)  Elevation  incountered  Btatic  Site Manager  CEARP Manager
ARAPANCE FORMATION  17.8-19.8' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: dusky yellow (5 Y 6/4) to light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); blocky structure; no HCl reaction; moist to wet.  19.8-21.8' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: Same as above except small pockets of caliche; moist.  TOTAL DEPTH: 21.8'.		Lithologic Description	
	- 25 - 30	ARAPAHOE FORMATION  17.8-19.8' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: dusky yellow (5 Y 6/4) to light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); blocky structure; no HCl reaction; moist to wet.  19.8-21.8' SAMPLE. Recovered 2.2/2.0' = 110%. CLAYSTONE: Same as above except small pockets of caliche; moist.	Readings: HNu=0.0(0.0); OVA=0.4(0.4). 19.8-21.8!: Field Screen Readings: HNu=0.0(0.0);

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Boring No.: SP06-87			
Completed as well? No			
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Packer Test Data and Results			
Water Level Data			
Saturated Thickness Hydrographs			

-			
	ocky Flats Plant; Solar Ponds Area Borehole		
		Surface	Elevation *5972.9'
Total Depth	30.7' Water L	evel End	ountered None
		Sta	tic
Drilling Con	npany <u>Boyles Bros.</u> Oriller	R. Shar	ם
Date Drille	November 18 and 19, 1987	T. Merr	itt
		Fluid No	
		71010 <u>210</u>	
Logged By	J. Bacchus Checkee	4 By	Site Manager
			CEARP Manager
Comments	Borehole backfilled with Portland Type I Cer		
	*Coordinates and elevation estimated from to	opographi	ic map.
			7
/3	Lithologic Description		Samples Collected
	Lithologic Description		Other Tests Perform
	/6 4/6 k/		
<del>-</del> 0			
	ARTIFICIAL FILL/DISTURBED		HNu Background=0.7 OVA Background=0.8
	0.0-2.0' SAMPLE.		Ludlum Background=0.0
	Recovered 0.7/2.0' = 35%. 0.0-0.4': SOIL: dark yellowish brown	(10 YR	0.0-0.71: Readings on
	4/2); sandy; grass and roots; wet to moist.	1	Core: HNu = 0.2; OVA =
•	0.4-0.7': CLAY: moderate yellowish brown 5/4) mottled with very pale orange (10 Yi		0.7.
	caliche; sand; small angular cobbles; moist		0.0-0.7': Field Screen Readings: HNu=0.4(0.3);
	2.0-4.01 SAMPLE.		OVA=0.6(0.6).
<del></del> 5 ·	Recovered 1.7/2.0' = 85%,		2.0-3.71: Readings on
	CLAY: same as above, except slightly clasts; moist.	larger	Core: HNu=0.6; OVA=0.7.
•		1	2.0-3.7': Field Screen
	4.0-5.0' SAMPLE. Recovered 0.0/1.0' = 0%.		Readings: HNu=400(45);
	QUARTZITE: angular block.	Ì	OVA=0.8(0.6).
	5.0-8.01 SAMPLE.		2.0-3.71: Field Screen
	Recovered 1.5/3.0' = 50%.	D 4443.	Sample: SP068702FS.
	CLAYEY SAND: dark yellowish orange (10 Y large angular pebbles; slight HCl reaction;	dry.	5.0-6.51: Readings on
<del></del> 10	8.0-10.5' SAMPLE.		Core: HNu=0.4; OVA=0.8.
10	Recovered $2.4/2.5' = 96\%$ .		5.0-6.51: Field Screen Readings: HNu=0.4(0.4);
	8.0-10.0': SOIL: dusky brown (5 YR 2/2); clay, sand, silt, and small angular cobbles		OVA=0.0(0.0).
	10.0-10.4': SAND: pale yellowish brown	(10 YR	8.0-10.41: Readings on
	6/2); contains clay and silt; small cobbles; no HCl reaction; dry.	angular	Core: HNu=0.0; OVA=1.7.
			8.0-10.4': Direct Hit
	10.5-13.0' SAMPLE. Recovered 1.9/2.5' = 76%.		Sample: SP068708DH.
	CALICHE: very pale orange (10 YR 8/2)		10.5-12.41: Readings on
	silt, clay, small cobbles and pebbles; cla	ists are	Core: HNu=5.0; OVA=1.9;
15			Ludlum≈1.
	13.0-15.5' SAMPLE. Recovered 1.3/2.5' = 52%.		10.5-12.4': Direct Hit
	CALICHE: same as above except the same	mple is	Sample: SP068711DH.
	coarser at the bottom.		13.0-14.31: Readings on
	15.5·18.0' SAMPLE.  Recovered 1.2/2.5' = 48%.		Core: HNu=1.2; OVA=20.0;Ludlum=1.
	CALICHE: same as above but not as coars	e; more	•
	small angular cobbles; slightly moist.	l	13.0-14.3': Direct Hit Sample: SP068713DH.
		ì	

Orilling Company Date Drilled Drilling Method Logged By Geologist	Driller Helper Drilling Fluid	Site Manager
Geologist		Site Manager
Comments		CEARP Manager
Lithologic De	scription	Samples Collected e Other Tests Performs
ARAPAHOE FOR	MATION	15.5-17.7': Readings on Core: HNu=1.0; OVA=3.0.
18.0-20.5' SAMPLE.  Recovered 5.0/2.5' = 200%.  CLAYSTONE: light olive gr  with dark yellowish orange		15.5-17.7': Direct Hit Sample: SP068716DH.
near the bottom of the run moist.		18.0-20.5': Readings on Core: HNu=0.0; OVA=2.3.
20.5-23.0' SAMPLE.  Recovered 3.3/2.5' = 132%. 20.5-21.0': SANDSTONE: dar Y 6/6) mottled with very pa	le orange (10 YR 8/2);	18.0-20.5': Direct Hit Sample: SP068718DH. 20.5-23.0': Readings on
grains are well rounded; him well rounded pebbles; dry. 21.0-23.0': CLAYSTONE: 6/2) mottled with dark ye 6/6); pockets of sand; no continuous.	ight olive gray (5 Y llowish orange (10 YR	Core: HNu=0.0; OVA=2.0.  20.5-23.0': Direct Hit Sample: SP068721DH.
to dry.  Total depth of borehole π depth.	measured 23.21; adjust	23.2-25.71: Readings on core: HNu = 2.2; OVA = 7.4.  23.2-25.71: Direct hit
23.2-25.7' SAMPLE.  Recovered 2.5/2.5' = 100%.  CLAYSTONE: same as above.  25.7-28.2' SAMPLE.		sample: SP068724DH.  25.7-28.2': Readings on core: HNu = 1.0; OVA = 6.4.
Recovered 2.8/2.5 = 112%. CLAYSTONE: olive gray weathered; contains sand ne dry.	(5 Y 3/2); slightly ar the top of the run;	25.7-28.2': Direct hit sample: SP068726DH. 28.2-30.7': Readings on
28.2-30.7' SAMPLE.  Recovered 3.0/2.5' = 120%.  CLAYSTONE: olive gray (5 light brown (5 YR 5/6);		core: HNu = 1.0; OVA = 1.8; Ludlum = 5.
35 structure; dry. TOTAL DEPTH:	30.7'	readings: HNU = 1.0(1.0); OVA = 1.4(1.4).

### INDEX OF DATA

Boring No.: SP07-87
Completed as well? No
Data in File
X Log of Borehole
Well Construction Summaries
Well Development Summaries
Hydraulic Conductivity Test Data and Results
Packer Test Data and Results
Water Level Data
Saturated Thickness Hydrographs

Location Rocky Flats Plant;  Coordinates * N 37485 E 2  Total Depth 31.0'  Drilling Company Boyles Bro Date Drilled November 12 and	2100 C	Ground Surface Water Level E	ncountered 18.0'
Drilling Method Hollow Stem	· <del>-</del>	Drilling Fluid	
Logged By J. Bacchus			
Geologist		Checked By	Site Manager
Roreholo backfill	od with Dontland Two		CEARP Manager
Comments Borehole backfill *Coordinates and	elevation estimated		hic map.
	Lithologic Descrip	otion	Samples Collected of Other Tests Perform
	ARTIFICIAL FILL/DISTU	RBED	HNu Background = 0.0-0.8.  OVA Background = 0.0-0.6.  Ludlum Background = 0.0.
Recover CLAY: angutai	O' SAMPLE. red 1.8/2.0' = 90%. moderate yellowish brown (1 r cobbles; pebbles; sand and roots; caliche; moist.	0 YR 5/4); small and silt; green	0.0-1.8: Readings on core: HNu = 0.1; OVA = 6.0.
Recove 2.0-2.	o' SAMPLE. red 1.8/2.0' = 90%. '': CLAY: same as above.		0.0-1.8': Direct hit sample: SP078700DH.  2.0-3.8': Readings on
-,	ROCKY FLATS ALLUVIU	_	core: HNu = 4.0; OVA = 11.
clasts	5': GRAVEL: dark reddish tare very angular quartzite; ; very sticky; moist.	; clay in between	2.0-3.81: Direct hit sample: SP078702DH.
pebble	B': CLAY: moderate bros; sand and silt; dry.  D' SAMPLE.	оwn (5 YR 4/4);	4.0-5.0': Readings on core: HNu = 0.8; OVA = 0.0.
	red 1.2/1.0' = 120%. same as above except muc	h larger clasts;	4.0-5.0': Field screen readings: HNu = 0.5(0.5); OVA = 0.6(0.5).
5.0-8. Recove 5.0-5.	<u>O'SAMPLE.</u> red 1.3/3.0' = 43%. 8': CLAY: Same as above. 3': CLAY: dusky yellowi	ish brown (10 YR	5.0-6.31: Readings on core: HNu = 0.6; OVA = 0.0.
(10 YR pocket	t the top grading to dark 6/6) at the bottom; gravel s of caliche; slightly mois	i, sand and silt;	5.0-6.3': Field screen readings: HNu = 0.5(0.5); OVA = 0.4(0.4).
Recove 8.0-8. 8.5-10	.5' SAMPLE. red 2.3/2.5' = 92%. 5': CLAY: same as above. .3': CLAY: dusky brown (		8.0-10.3': Readings on core: HNu = 0.5; OVA = 0.8.
10.5-1 Recove	e; cobbles; sand; pebbles; : 3.0' SAMPLE. red 1.7/2.5' = 68%.		8.0-10.3': Field screen readings: HNu = 0.3(2.2); OVA = 6.8(3.2).
more v 11.3-1 6/2);	2.2': SILT: pale yellow clasts of angular pebbles a	ish brown (10 YR	8.0-10.3': Field screen sample: SP078708FS.  10.5-12.2': Readings on
sand;	no HCl reaction; dry.		core: HNu = 1.0; OVA = 24. 10.5-12.2': Direct hit sample: SP078711DH.

Comments		Ground Surface Water Level E S Driller Helper Drilling Fluid	No. SP07-87(cont'd.)  Elevation  ncountered  Static  Site Manager  CEARP Manager
	Lithologic Desc	ription	Samples Collected e Other Tests Performe
- 25 - 25	Recovered 1.8/2.5' = 72%.  13.0-15.5' SAMPLE. Recovered 1.8/2.5' = 72%.  13.0-13.8': SILT: same as abo  13.8-14.8': CLAY: mottled di  (10 Y 6/6) and grayish olive silt; pebbles and small cobbles  15.5-18.0' SAMPLE. Recovered 1.2/2.5' = 48%. SAND: grayish orange (10 YR large angular pebbles; high moist.  18.0-20.5' SAMPLE. Recovered 1.3/2.5' = 52%. SAND: Same as above but more of  20.5-23.0' SAMPLE. Recovered 3.8/2.5' = 155%. 20.5-21.3': SAND: same as above  ARAPAHOE FORMAT  21.3-23.0': CLAYSTONE: light 8/6); dense; moist.  23.0-26.0' SAMPLE. Recovered 5.0/3.0' = 167%. CLAYSTONE: same as above.  26.0-28.5' SAMPLE. Recovered 3.0/2.5' = 120%. 26.0-27.2': CLAYSTONE: same is mottled with light brown (5 YR)  28.5-31.0' SAMPLE. Recovered 3.3/2.5' = 132%. CLAYSTONE: same as above.  TOTAL DEPTH: 3	ark greenish yellow (10 Y 4/2); sand; ; moist.  7/4); coarse; clay; amount of caliche; coarse; wet.  FION  It olive gray (5 Y wish orange (10 YR description) as above.  We gray (5 Y 3/2); 5/6); dense; dry.	13.0-14.8': Readings on core: HNu = 0.4; OVA = 30.  13.0-14.8': Direct hit sample: SP078713DH.  15.5-16.7': Readings on core: HNu = 1.0; OVA = 11.  15.5-16.7': Direct hit sample: SP078716DH.  18.0-19.3': Readings on core: HNu = 0.6; OVA = 11.  18.0-19.3': Water table sample: SP078718WT.  20.5-23.0': Readings on core: HNu = 1020; OVA = 2.0.  20.5-23.0': Contact sample: SP078721CT.  23.0-26.0': Readings on core: HNu = 95; OVA = 5.2.  23.0-26.0': Bedrock sample: SP078723BR.  26.0-28.5': Readings on core: HNu = 0.4; OVA = 4.0; Ludlum = 2.  26.0-28.5': Direct hit sample: SP078726DH.  28.5-31.0': Readings on core: HNu = 0.6; OVA = 0.2; Ludlum = 1.

### INDEX OF DATA

Boring No.: 39-87BR/SP08-87			
Completed as well? Yes			
Data in File			
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X Well Construction Summaries			
X Well Development Summaries			
Hydraulic Conductivity Test Data and Results			
X Packer Test Data and Results			
X Water Level Data			
Saturated Thickness Hydrographs			

Coordinates Total Depth  Drilling Con Date Drilled  Drilling Met Logged By	N 38094.04 E 22166.32  140.00'  Boyles Bros.  Cot. 29-30 and Nov. 6-10, 1987  Hollow Stem Auger; NC Core  R. Treat; K.D. Holliway  Geologist  Ground Surface Water Level E  S  Driller T. High Holper B. Kee  Drilling Fluid Checked By	ney None
Comments	Lithologic Description	Samples Collected or Other Tests Performed
- - - - - - - -	ARTIFICIAL FILL/DISTURBED  0.0-2.0' SAMPLE. Recovered 0.7/2.0' = 35%. GRAVEL AND CLAY: dark dusky brown (5 YR 2/2) to mixed light brown; weakly cemented; subangular, subrounded quartzite gravel; poorly sorted; low plastic; slightly sandy; fine-grained; light moist.  2.0-3.5' SAMPLE. Recovered 1.5/1.5' = 100%. 2.0-3.2': GRAVEL AND CLAY: dark yellowish orange (10 YR 6/6) to moderate yellowish orange (10 YR 5/4) with gravel to 4.00 mm and larger; sand varying (2.0-	HNu background=0.2. OVA Bachground=2.8 Ludlum background = 0.0  0.0-2.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background.  2.0-3.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). No ludlum readings above background.
_10	1.5 Ø to 0.5-1.0 Ø); light moist. 3.2-3.5': CLAY: dark yellowish orange (10 YR 6/6) moderately cemented; slightly sandy; fine-grained; occasional small scattered gravel; highly plastic; very moist.  3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%. 3.5-5.2': CLAY: moderate brown (5 YR 4/4) to varying gray; considerably oxide	3.5-6.5': Upper contact sample: SP088703UC.  6.5-8.5': Contact sample: SP088706CT.  9.0-11.5': Bedrock sample: SP088709BR.
<u>15</u>	stained; low plastic; fine-grained sand (3.0-2.5 Ø); weakly cemented; claystone fragments; moist.  ARAPAHOE FORMATION  5.2-6.5': CLAYEY SANDSTONE: light gray (N 7/0); fine-grained sand (3.0-2.5 Ø) and finer; weakly cemented; weathered;	11.5-14.0': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8). 14.0-16.5': Field screen readings: HNu = 0.2 (0.2); OVA = 2.8 (2.8).

\_20

moist.

Location		Borehole/Well No. 39-87BR/SP08-87 (con't.		
Coordinates Ground Surface			Encountered	
			Drilling Co	ompany
Date Drille	•d			
	thod	Drilling Fluid		
	Geologist			
	Geologist	•••.•• •, <u> </u>	Site Manager	
		-	CEARP Manager	
Comments				
20	Lithologic Desc	ription	Samples Collected or Other Tests Performed	
	6.5-9.0' SAMPLE.		T T	
<u>25</u>	Recovered 2.0/2.5 = 80%.  SANDSTONE: light graseverely oxide stained grained sand (3.0-2.5 Ø); wassive; slight clay bin moist.  9.0-11.5 SAMPLE.  Recovered 2.5/2.5 = 100% CLAYEY SANDSTONE: (Fe) browns to grays; fine	brown; fine- reakly cemented; der; weathered;	19.0': Readings in augers: HNu = 0; OVA = 28.	
<u>30</u>	above; massive; wea weathered; moist.  11.5-14.0' SAMPLE. Recovered 1.5/2.5' = 60%. CLAYEY SANDSTONE: continued moderately weathered.	kly cemented; as stated above	-	
<u>35</u>	14.0-16.5' SAMPLE. Recovered 2.0/2.5' = 80%. CLAYEY SANDSTONE: 7/0) to severely oxide sand (3.0-2.5 Ø); massiv weakly to moderate weathered; moist.  16.5-19.0' SAMPLE. Recovered 2.3/2.5 = 92%. CLAYEY TO VERY C STONE: oxide stained gray; low plastic; m cemented; weathered; moi	stained brown; ve; low plastic; ely cemented;  LAYEY SAND- brown to light tassive; weakly		
<u>40</u>	temented, weathered, mor		2	

		Ground Surface Water Level E S Driller	Borehole/Well No. 39-87RR/SP08-87 (con't Ground Surface Elevation		
Drilling Method		Drilling Fluid			
Logged By	Geologist	Checked By	Site Manager		
		_	CEARP Manager		
Comments	***				
40	Lithol	ogic Description	Samples Collected or Other Tests Performed		
50	stained to light fine-grained; where the stained is stained to light fine-grained; where the stained is stained in the stained	2.5' = 56%.  DSTONE: moderately oxide at gray (N 7/0) massive, eathered; moist.  PLE.  2.5 = 72%.  IDSTONE: light gray (N oxide stained brown; low (3.5-3.0 Ø to 2.5-2.0 Ø); ed; massive; moist.  PLE.  2.5 = 60%.  AYEY SANDSTONE: as oist.  YSTONE: medium gray (N blocky; remaining slightly Ø); low plastic; weathered;  PLE.  2.5 = 100%.  medium gray (N 7 0) am plastic; slightly blocky: tly oxide stained in streaks a for 2" streaks.			

Coordinates Total Depth		_ Ground Surfac _ Water Level	No. 39-87BR/SP08-87 (con'  Elevation  Encountered  Static
Drilling Company		_ Driller	
	Geologist	Checked By _	Site Manager
Comments			CEARP Manager
	Litho	logic Description	Samples Collected or Other Tests Performed
60/	/ • · · · /		
65	(31.5-32.0') the grained; sever a light medium to medium moist.  34.0-36.5' SAM Recovered 2.5 CLAYSTONE: medium gray	YSTONE: upper formation ten slightly sandy, fine-ely oxide stained brown to m gray (N 6/0); massive; low plastic; weathered; blocky;  IPLE.  /2.5 = 100%.  : dark gray (N 3/0) to (N 5/0); massive; medium ky; slightly sandy; fine-	69.40-79.05: Packer Test Interval # 8.
70	Recovered 1.7 CLAYSTONE: 4/4) to med massive; block sandy; weathe	/2.5 = 68%. : moderate brown (5 YR lium dark gray (N 6/0); ky; medium plastic; slightly red; streaked, moist.	
75	(N 4/0); mas: fine-grained; 41.5-44.0' SAI Recovered 1.2 CLAYSTONE gray (N 4/0'	/2.5 = 88%. /SHALE: medium dark gray sive; blocky slightly sandy; medium plastic; moist.  MPLE.	
80			Page 4 of 19

Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method Logged By	Geologist	Ground Surface Water Level E S Driller Helper Drilling Fluid Checked By	No. 39-87BR/SP08-87 (con't.)  Elevation Incountered Static  Site Manager  CEARP Manager
80	Lithold	gic Description	Samples Collected or Other Tests Performed
85	41.3-45.4' SAMP  Recovered 1.68/  RQD = 1.04/1.68  41.3-41.8': CLAY  41.8-42.35': SIL  gray (N 3/0) t  some very fine- unconsolidated; hardness; damp.  42.35-44.03': S  STONE: olive b fine-grained (	4.10' = 41%.  3' = 62%.  YSTONE PLUG. TY CLAYSTONE: dark o olive black (5 Y 2/1); grained sand; well sorted; blocky; soft to medium  ANDY SILTY CLAY-lack (5 Y 2/1); sand very 3.5-4.0 Ø), well sorted; locky; medium hardness;	79.05-88.70': Packer Test Interval # 7.  88.70-98.35': Packer Test Interval # 6.  98.35-108.00': Packer Test Interval # 5.
90	4/1) to olive by fine-grained (3. occasional lens sand (3.0-2.5 Ø) increasing down	4.10' = 100%.	
95	hard; at 45.80'	have a leaf imprint; occa- throughout core; damp.	
100			Page 5 of 19

Coordinates Total Depth  Drilling Company	Ground Water L	e/Well No. 39-87BR/SP08-87 (con't Surface Elevation evel Encountered Static
Drilling Method	Drilling	Fluid
Logged By	Geologist	d By Site Manager
Comments		CEARP Manager
100	Lithologic Description	Samples Collected or Other Tests Performed
105	49.5-54.0' SAMPLE. Recovered 4.20/4.50' = 93.30%. RQD = 2.70/3.90' = 69%. 49.5-50.7': SANDY CLAYSTONE: gray (5 Y 3/2); cuttings from moist. 50.7-54.0': SANDY CLAYSTONE: gray (5 Y 4/1) to olive black (5 same as 45.40-49.50' interval; at have some fine-grained sand staine yellowish orange (10 YR 6/6); lefine-grained sand increase down of 53.5'-54.0' clay is predominant; dame	above; : olive Y 2/1); 52.25' ed dark nses of core; at 115.65-125.30': Packer Test Interval # 2. 117.65-127.30': Packer Test Interval # 2.
110	54.0-57.0' SAMPLE.  Recovered 3.3/3.0' = 110%.  RQD = 2.45/3.30' = 74%.  SANDY CLAYSTONE: same as with nodules of very pale orange (8/2) clay and very fine-grained same creasing down core: at 56.22' had imprint: less fine-grained sand damp.	(10 YR and in- ve leaf
115	57.0-61.0' SAMPLE. Recovered 4.0/4.0' = 100%. RQD = 4.0/4.0' = 100%. SANDY CLAYSTONE: same as with more fine-grained sand lense nodules still present; more organic above; clay increases down core 60.0-61.0' mostly clay; damp.	es; clay cs than
120	61.0-65.0' SAMPLE. Recovered 0.0/4.0' = 0%. Lost core.	Page 6 of 19

Location		Borehole/Well	No. 39-87BR/SP	08-87 (con't.
Coordinates		Ground Surfac	e Elevation	
Total Depth		Water Level 1	Encountered	
		. !	Static	
Drilling Company		Driller		
Date Drilled				
Drilling Method _		Drilling Fluid		
Logged By	Geologist	Checked By	\$ite M	
	Geologist		\$ite M	282901
		-	CEARP	Manager
Comments				
120	Lithold	ogic Description	Samples Co Other Tests	liected er Performed
120				
125	4/1) to dark g from 65.0-65.3'; Y 2/1); trace vo mangled from consolidated an 66.0-70.0' SAMF Recovered 5.0/4 RQD = 2.6/5.0' 66.0-67.5': CLA 2/1) to brownis silt and very organics; block:	light greenish gray (5 GY greenish gray (5 GY 2/1) rest of core olive black (5 ery fine-grained sand; core drilling; appears und blocky; damp to moist.  PLE. 4.0' = 125%.  = 52%.  YSTONE: olive black (5 Y sh black (5 YR 2/1); trace fine-grained sand; some y; consolidated; damp.		
130	2/1) to brownisilt and very organics; block 68.5-69.5': CLA 2/1) to greenish (N 1/0); trace s 69.5-70.0': CLA	YSTONE: olive black (5 Y sh black (5 YR 2/1); trace fine-grained sand: some y; consolidated; damp. YSTONE: olive black (5 Y a black (5 GY 2/1) to black ilt; blocky; damp. AYSTONE: medium bluish to medium gray (N 5/0);		
135	highly plastic;  70.0-74.0' SAMI  Recovered 0.6/  RQD = 0%.  CLAYSTONE:	block; moist.  PLE. 4.0' = 15%.  olive black (5 Y 2/1) to gray (N 4/0); blocky:		
140				10

Location		Borehole/Well	No. 39-87BR/SP08-87 (con't
Coordinates			e Elevation
Total Depth		Water Level	Encountered
,			Static
Drilling Company		Driller	
Date Drilled		Helper	
Drilling Method		Drilling Fluid	
Logged By		Checked By	
Ge	ologist	0,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Site Manager
Commonto		-	CEARP Manager
Comments			
	Lithologic	Description	Samples Collected or Other Tests Performed
	74.0-76.0' SAMPLE.		
+ +	Recovered 3.85/2.0'	= 193%.	
	RQD = 2.26/3.85' = 3		
† †	Picked up 1.85' from		
1 1		FONE: olive black (5	
	blocky, homogenous:	s of black (N 1/0);	
+ +	74.0-76.0': CLAYSTO	ONE: olive black (5 Y	
		ray (N 5/0), blocky,	
† †	homogenous; plastic;		
4 4			
	76.0-80.0' SAMPLE.	5 2 07	
† †	Recovered $2.13/4.0^{\circ}$ ROD = $1.50/2.13^{\circ}$ =		1
		black (5 Y 2/1); some	
<b>† †</b>		es; trace very fine-	
+ +	grained sand in	terbeds; homogenous;	
	blocky; medium har	dness; damp.	
<b>†</b> †	000000000000000000000000000000000000000		1
1 1	80.0-82.0' SAMPLE. Recovered 2.62/2.01		1
	RQD = 1.62/2.62' =		
+ +		NE: olive black (5 Y	
1 1	2/1); some very fin	e-grained sand, poorly	
TT	T sorted, subangular	to subrounded fine-	
+ +		urring in lenses and	
		t; some organics; small	
† †	medium hardness;	y; fairly homogenous:	
1 1	inculum nardness, c	aamp.	
+ +	†		
	1		
† †	T		
ļ ļ	+		
	<del></del>		Page 8 of 19

Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method Logged By	Geologist	Ground Surfac Water Level Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con't.  e Elevation  Encountered  Static  Site Manager  CEARP Manager
	Lithe	plogic Description	Samples Collected or Other Tests Performed
	STONE INTE  2/1) to dark grained to fit occurs in lense stringers of co no orientation consolidated; 83.0-84.0' have sorted fine-g subrounded; q	3/2.0' = 119%.	
	2/1) to dark gray (5 Y 8/occasional, stringers of coconsolidated;	/2.0' = 100%0' = 86%. YSTONE: olive black (5 Y gray (N 3/0) with yellowish 1) fine-grained sand lenses poorly sorted; occasional oal; some silt; some organics; damp.	
	T T	$1/2.0^{\circ} = 100\%.$	
. ]	T T		

Coordinates Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method Logged By  Geologist	Ground Surface Water Level E  Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con't  Elevation  Encountered  Static  Site Manager  CEARP Manager
88.0-92.0' SAMP Recovered 4.0/4 RQD = 3.63/4.0' 88.0-91.0': SAN black (5 Y 2/1 some clay; lots grained fairly lenses of a fine damp. 91.0-92.0': SIL' black (5 Y 2/1) 8/1) to pinkish grained sand, f lenses and int organics; smal present in sa damp.  92.0-96.0' SAMP Recovered 4.0/4 RQD = 3.83/4.0 92.0-94.25': SIL black (5 Y 2/1) 8/1); very fin sand, fairly we lamination; less some occasions damp. 94.25-95.2': SA SANDSTONE: grained sand; d	.0' = 100%. = 91%. IDY SILTSTONE: olive ) and dark gray (N 3/0); of silt; some very fine- well sorted sand with -grained, well sorted sand; IY SANDSTONE: olive with yellowish gray (5 Y a gray (5 YR 8/1) fine- airly well sorted; sand in erbeds; some clay; some l planes of lamination nd lenses; consolidated;  LE. 0.0' = 100%. TY SANDSTONE: olive 1.0' to yellowish gray (5 Y e-grained to fine-grained ell sorted; some planes of silt and clay than above; al organics; consolidated: NDY SILTSTONE/SILTY same as above with finer-	
92.0-94.25'; dam	p.	10 19

ordinates otal Depth  prilling Company sate Drilled  prilling Method  ogged By  Geologist	Driller Helper Drilling Fluid	Site Manager  CEARP Manager
	Description	Samples Collected or Other Tests Performed
black (5 Y 2/1); v fairly well sorted some clay; some org planes; consolidate 97.2-97.35' have le gray (5 Y 6/1) to fairly well sorted sand; damp. 97.35-99.0': SILTST 2/1); very fine-gra claystone downcord 98.85'; consolidated occasional nodules YR 7/4) clay, pron some organics; dam 99.0-100.0': CLAYE black (5 Y 2/1); t sand; lots of silt; dated; some organ	= 107%.  3%.  Y SILTSTONE: olive ery fine-grained sand, in siltstone matrix; ganics; some lamination d; at 96.10-96.50' and enses of a light olive olive black (5 Y 2/1), moist, fine-grained  ONE: olive black (5 Y 2/1), in moist, fine-grained and disappearing at the sand sign pearing at the sand sign pearing at the same clay; lots silt; of gravish orange (10 minent from 97.35-98.0';	

Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method Logged By  Comments	Geologist	Ground Surfac Water Level   Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con't.)  • Elevation Encountered Static  Site Manager  CEARP Manager
	Lithol	ogic Description	Samples Collected or Other Tests Performed
	black (5 Y 2/sand; fairly damp. 101.0-101.5': S lowish gray (5 2/1); sand frupper portion portion fairly some silt; little to moist. 101.5-102.61': C gray (N 4/0) to plastic; blocky sand; damp to  104.0-108.0' SA Recovered 4.0/RQD = 3.27/4.0 CLAYSTONE:	/4.0' = 65.3%. 61' = 96%. LAYEY SILTSTONE: olive 1); trace very fine-grained homogenous; consolidated;  ILTY SANDSTONE: yel- Y 8/1) to olive black (5 Y om very fine-grained in to fine-grained in lower well sorted, subrounded; e clay; consolidated; damp CLAYSTONE: medium dark of dark gray (N 3/0); highly y; homogenous: no silt or moist.  MPLE. 4.0' = 100%. 0' = 82%. olive black (5 Y 2/1) to 3/0); trace silt; blocky;	

Lithologic Descri		
108.0-112.0' SAMPLE. Recovered 3.9/4.0' = 98%. RQD = 3.49/3.9' = 89.5%. 108.0-110.0': SILTSTONE: o 2/1); some very fine-grain clay; some organics; fairl' consolidated; hard; more sa damp. 110.0-1111.90': SANDSTONE: gray (5 G 4/1) to greenis 6/1) with some yellowish g very fine-grained (3.5-4.0 grained (3.0-2.5 Ø); fairly subangular to subrounded; clay; some leaf and plant increases down core; sand down core with occasional coarser grains; massive; dans	elive black (5 Y ned sand; some y homogenous; and down core; it dark greenish sh gray (5 GY gray (5 Y 8/1); ) Ø) to fine-y well sorted; some silt; trace stem organics, I fines as goes I lenses of the	Samples Cellected er Other Tests Performed

Coordinates _ Total Depth _  Drilling Compa Date Drilled _  Drilling Method	Geologist	Ground Surfact Water Level ( Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con  • Elevation  Encountered  Static  Site Manager  CEARP Manager
		Lithologic Description	Samples Collected or Other Tests Performed
	Recover RQD = 112.0-11 black (5 20% san 112.5-11 (5 GY 4/1) wit fine-gra grained core; oc associate through zones of at 112.7 small fr ring thr 115.75-1 black (5 grained occurring	ed 4.67/4.0° = 117%. 3.23/4.67' = 69%. 2.5': SANDY SILTSTONE: olive 3.27); 40% silt; 40% organics; d; consolidated; damp to moist. 5.75': SANDSTONE: greenish gray 6/1) to dark greenish gray (5 G.h. some yellowish gray (5 Y 8/1); ined (3.0-2.0 Ø) to medium- (2.0-1.5 Ø) sand, fining down casional lenses of clay and silt ed with organics occurring out the core; sand massive with f contorted bedding; consolidated; 5' have a fracture of coal with actures of coal or organics occur- oughout the core; damp to moist. 16.0': SILTY SANDSTONE: olive to medium-grained as above. Ig in lenses; many organics with sociated: very hard; consolidated:	

Coordinates Total Depth  Drilling Compan Date Drilled  Drilling Method	Geologist	Ground Surfac Water Level 1  Driller Helper Drilling Fluid	No. 39-87BR/SP08-87 (con't.)  • Elevation  Encountered  Static  Site Manager  CEARP Manager
		Ithologic Description	Samples Collected or Other Tests Performed
	Recovered RQD = 0.4 116.0-116.3 AND CLA 116.3-116.9 black (5 Y 8/1) and grained sa organics; moist. 116.9-118.0 STONE: o influence;	2' SAMPLE. 2.0/4.0' = 50%. 35/2.0' = 22.5%. 3': CUTTINGS OF SILTSTONE. AYSTONE: reworked. 2': SANDY SILTSTONE: olive. 2' 2/1) with yellowish gray (5 Y greenish gray (5GY 6/1) finemand in lenses; some clay; some massive; consolidated; damp to 2': CLAYEY SANDY SILT-live black (5 Y 2/1); heavy silt sand is very fine-grained; some massive; consolidated; damp.	

Lithologic Description    120.0-122.0' SAMPLE.   Recovered 4.6/2.0' = 230%.   RQD 3.97/4.6' = 86%.   118.0-120.0': CLAYEY SILTSTONE: olive black (5 Y 2/1) to greenish black (5 GY 2/1); trace very fine-grained sand; some organics; occasional seams of coal; massive; blocky; fairly homogenous; consolidated: damp.   120.0-121.4': CLAYEY SILTSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); trace very fine-grained sand in lenses; some organics; massive; consolidated: damp.   121.4-122.0': SANDSTONE: dark greenish gray (5 G 4/1) to greenish black (5 GY 2/1); some silt in top of core giving way to sand; fine-grained to medium-grained (2.0-1.5 Ø) sand, subrounded to subangular; feldspathic and quartzitic; fairly well sorted: massive; homogenous; consolidated; few organics; damp to moist.	Coordinates Total Depth  Drilling Compar  Date Drilled  Drilling Method	Geologist	Groun Water Drille Helpe	d Surfac	No. 39-87BR/SPO  Elevation Encountered Static  Site M  CEARP	
		120.0-1 Recove RQD: 118.0-1 black 2/1); organi massiv solidat 120.0-1 greeni (5 GY in lendated; 121.4-1 gray ( 2/1); s to san (2.0-1 subang fairly	ered 4.6/2.0' = 230%.  3.97/4.6' = 86%.  120.0': CLAYEY SILTSTON  (5 Y 2/1) to greenish blact concerning the same of the second seams of the second seams of the second seams of the second seams of the second seams of the second seams of the second seams of the second seams of the second seams of the second seams of the second seams of the second seams of the second secon	k (5 GY nd; some of coal; ous; con- NE: dark ish black ned sand consoli- greenish k (5 GY ving way n-grained ded to uartzitic; nogenous;		liected or Performed

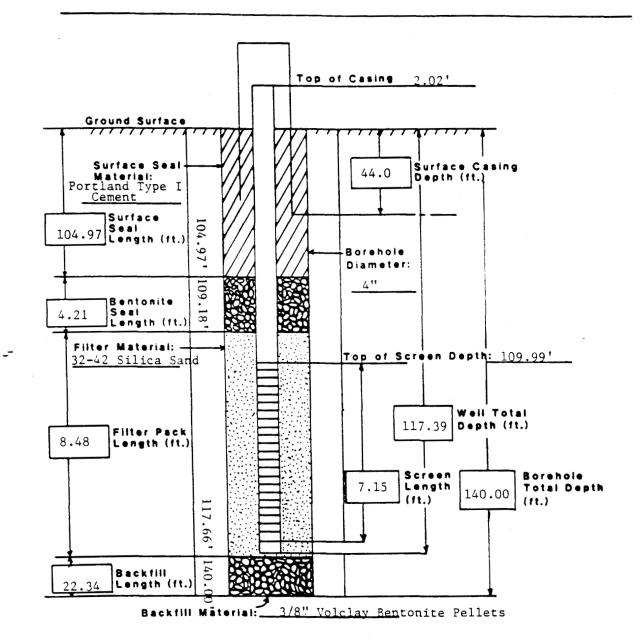
Location		Borehole/Well	No. 39-87BR/SP08-87 (co	<u>n'</u> t
Coordinates		Ground Surfac	e Elevation	
		Water Level !	Encountered	
			Static	
Drilling Company				
		•		
roddeg BA	Geologist	Checked By _	Site Manager	
	Geologist		Site Menager	
Comments		-	CEARP Manager	
				_
· / - /.				
	Litholo	gic Description	Samples Collected of Other Tests Performs	r • <b>4</b>
<del></del>				
1 1	122.0-126.0' SAM	PLE.		
TT	T Recovered 4.0/4.			
+ +	RQD = 3.65/4.0'			
		NDSTONE: greenish gray		
↓ ↓		reenish black (5 G 2/1);		
		rained to medium-grained		
+ +	$(2.5-1.5 \ \emptyset)$			
		rly well sorted; some		
+ +		c; consolidated; moist.		
	1	ANDSTONE/SILTSTONE:	1	
T T		G 6/1) to greenish black		
1 1		fine-grained sand with ained to medium-grained	1	
		e (122.0-122.85'); some		
↓ ↓		nan above; clay influence		
		and decreases down core		
+ +		ore silt, a little clay, and	-	
		massive; consolidated;		
† †	damp.	massive, consolidated,		
			1	
† †	126.0-130.0' SAM	PLE.	1	
1 1	Recovered 1.5/4.		1	
	RQD = 0.75/1.5	= 50%.		
1 1	. $\downarrow$ SANDSTONE: m	edium dark gray (N 4/0)		
		7/0); very fine-grained to	1	
+ +		5-2.5 Ø) feldspathic and		
	1 -	l; fairly well sorted;		
† †	massive; occasi			
1 1	planes; sand f			
T		lt; from 127.3-127.5' have		
1 1	zone of clay infl	uence; moist to wet.		
↓ ↓	- 🗼			
+ +	- +		1	
			Page 17 of 19	

Orilling Compan Date Drilled Orilling Method	Geologist	Driller Helper Drilling Fluid	Bite Manager  CEARP Manager
	Lithologic	Description	Samples Collected or Other Tests Performed
	(5 G 2/1); no org fairly homogenous; dry. 129.4-129.7': SILTY as above; damp to di 129.7-130.0': SILTY 5 above with some cl sand; moist. 130.0-132.0': SILTY greenish gray (5 G (5 G 6/1); very fine fine-grained (3.0-2.5 sand; some silt; m damp to moist.  132.0-136.0': SAMPLE Recovered 4.18/4.0' = RQD = 3.76/4.18' = 9 132.0-132.4': SANDS gray (5 G 4/1) to gr fine-grained (2.0-3.0 sorted; some silt; damp. 132.4-136.0': SILTY greenish gray (5 G (5 G 6/1); trace ve silt in top of core gi	= 217.5%. 34.6%. 34.6%. 3Y SILTSTONE: dark 4/1) to greenish black anics, hard; massive; consolidated; damp to  CLAYSTONE: same as ay; very fine-grained  SANDSTONE: dark 4/1) to greenish gray grained (3.5-4.0 Ø) to Ø). fairly well sorted tassive; consolidated;  = 104.5%. 20%. TONE: dark greenish gray (5 G 6/1); Ø) sand; fairly well massive; consolidated;  CLAYSTONE: dark 4/1) to greenish gray (5 G 6/1); Ø) sand; fairly well massive; consolidated;  CLAYSTONE: dark 4/1) to greenish gray ry fine-grained sand; ives way to clay down nous; massive; consolidated;	

Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method Logged By	Geologist	Ground Surface Water Level E  Driller Heiper Drilling Fluid	No. 39-87BR/SP08-87 (con't  Elevation  Encountered  Static  Site Manager  CEARP Manager
	Lithologi	c Description	Samples Collected or Other Tests Performed
	dark gray (N 3/0); massive; blocky; no	= 50%. 9%. dium gray (N 5/0) to some silt; homogenous;	

### WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area Well No. 39-87BR/SP08-87 Coordinates N 38094.04 E 22166.32 Elevation: Ground Surface 5947.10' Total Depth: Well 117.39' Top of Casing \_\_5949.12' Borehole 140.00' Formation of Completion \_\_Arapahoe Formation Casing Material Sch 5, Type 316, TFJ Stainless Casing Diameter Steel
Steel
Steel
National October 17-18, 1987 Stainless Steel Surface Casing Diameter \_\_\_5" ID Installed By K.D. Holliway Site Manager Geologist **CEARP Manager** Comments Surface casing set to 44.0' by R. Treat on October 30, 1987.



Well No.: 39-878R

# WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
12/1/87		Pumping		Dirty brown	Water level 43.53' after pumping
,					
				,	
-				,	

# PACKER TEST DATA SHEET

Location: Rocky Flats Plant; Solar Ponds Area Job No.: 2029-17-02

Well No.: 39-87BR

0.333 Borehole Diameter: \_\_

Acrylic Tube Diameter: 0.16631

Comments: Interval #2 (117.65 - 127.30') failed

Date of Water Level: 4/18/88

Page 1 of 2

Static Water Level: 83,981

			:								
Test interval	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage Preseure	Gage Height	Avg. H <sub>2</sub> O Height	Gage Height +Avg. H2O Height	Δħ	Date of Test	Lithology	Geologist
. [	122.68	132.33	15	0	5.90	4.25	10.15	0.03	11/11/87	Kass	KDH
			15	29.7	5.90	ŝ	5.90	0.12	11/11/87	Kass	KDH
			15	0	5.90	2.712	8.702	-0.02	11/11/87	Kass	KDH
3	115.65	125.30	15	0	5.90	3.94	9.84	-0.08	11/11/87	Kass	KDH
			15	28	5.90	1	5.90	1.21	11/11/87	Kass	КВШ
			15	0	5.90	2.528	8.428	-0.095	11/11/87	Kass	KDH
7	108.00	117.65	. 15	0	5.90	4.172	10.162	-0.025	11/11/87	Kass	KDH
			15	26	5.90	1	5.90	0.18	11/11/87	Kass	KDH
			15	0	5.90	3.558	9.458	-0.01	11/11/87	Kass	KDH
5	98.35	108.00	15	0	5.90	3.904	9.804	-0.01	11/12/87	KCI.	KDH
			15	24	5.90	ı	5.90	0.11	11/12/87	KCL	Крн
			15	0	5.90	2.519	8.419	-0.035	11/12/87	KCL	KDII
9	88.70	98.35	15	0	5.90	5.638	11.538	-0.010	11/12/87	KCL	KDH
			15	21.7	5.90	l	5.90	0.07	11/12/87	KCL	KDH
			15	0	5.90	5.537	11.437	-0.015	11/12/87	KCI.	KDH
7	79.05	88.70	15	0	5.90	4.437	10.337	0.02	11/12/87	KCL	KDH
			15	19.4	5.90	ŧ	5.90	0.08	11/12/87	KCL	KDH
			15	0	5.90	4,228	10.128	-0.015	11/12/87	KCL	KDH

				PAC	KER TEST	DATA S	SHEET				
Job No.:	2029-17-02	12							Static W	Static Water Level: .	
Location:	Location: Rocky Flats Plant:		Solar Ponds	Area					Date of V	Date of Water Level:	
Well No∴	ļ	39-87BR (cont'd.)							Page 2	- 01 -2	
Borehole Acrylic Tu	Borehole Diameter:	Jr.		5							
Test Interval	Top of Test Interval	Bottom of Test Interval	Test Length (minutes)	Gage	Gage Height	Avg. H <sub>2</sub> O Height	Gage Height +Avg. H20 Height	Δħ	Date of Test	Lithology	Geologist
82	69.40	79.05	15	0	5.90	3.68	9.58	00.0	11/12/87	KCI.	КВИ
			15	17.1	5.90		5.90	0.10	11/12/87	KCI.	KDH
			15	0	5.90	1,760	7,660	00.0	11/12/87	KCL	KDH
6	59.75	69.40	15	0	5.90	4.060	96.6	0.00	11/12/87	KC1.	Крн
			15	14.8	5.90	1	5.90	0.13	11/12/87	KCI.	KDII
			15	0	5.90	2.81	8.71	00.0	11/12/87	KCL	KDH
10 .	50.10	59.75	. 15	0	5.90	3,794	9,694	-0.050	11/13/87	KCL	KDH
			15	15.08	5.90	-	5.90	0.05	11/13/87	KCL	KDH
			15	ŋ	5.90	3.585	9.485	-0.015	11/13/87	KCI.	KDH
				-							
											i :

### PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 50.10 - 59.75
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

Q = INJECTION RATE = .00007240 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 54.92 + 5.90 + 15.08 \* 2.31 = 95.66
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MINK = .00000003 CM/SEC

2ND P1/3 TEST

TEST ABORTED

### PACKER TEST ANALYSIS

WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 59.75 - 69.40
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

K = ---- LN(--)2(PI)(L)(H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 9.96 + .00 \* 2.31 = 74.53

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

 $K = .00000000 \, \text{CM/SEC}$ 

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE; Q=0

P2/3 TEST

Q = INJECTION RATE = .00018825 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 5.90 + 14.80 \* 2.31 = 104.66

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN

K = .00000006 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 64.57 + 8.71 + .00 \* 2.31 = 73.28

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE Q=0

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/12/87 BY: KD HOLLIWAY

TEST INTERVAL (FEET BELOW G.S.): 69.40 - 79.05

MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

K = ---- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.23 + 9.58 + .00 \* 2.31 = 83.81

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;

P2/3 TEST

Q = INJECTION RATE = .00014480 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.23 + 5.90 + 17.10 \* 2.31 = 119.63

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000008 FT/MIN

K = .00000004 CM/SEC

2ND P1/3 TEST

Q = INJECTION RATE = .00000000 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS ABOVE WATER TABLE

HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 74.23 + 7.66 + .00 \* 2.31 = 81.89

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000000 FT/MIN

K = .00000000 CM/SEC

NOTE: NO WATER GAIN OR LOSS IN INJECTION TUBE;

Q=0

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 79.05 - 88.70
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

 $K = \frac{Q}{2(PI)(L)(H)} LN(--)$ 

1ST P1/3 TEST

Q = INJECTION RATE = .00002896 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 10.34 + .00 \* 2.31 = 94.23
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000002 FT/MIN K = .00000001 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00011584 (FEET3/MIN)
L = LENGTH OF TEST INTERVAL = 9.65 FEET
TEST INTERVAL IS ABOVE WATER TABLE
HEAD = DEPTH OF CENTER OF INTERVAL + GAGE HEIGHT
+ GAGE PRESSURE (IN FEET)
= 83.88 + 5.90 + 19.40 \* 2.31 = 134.59
R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000006 FT/MIN
K = .00000003 CM/SEC

2ND P1/3 TEST TEST ABORTED

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 88.70 - 98.35
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

1ST P1/3 TEST
TEST ABORTED

P2/3 TEST

\_

K = HYDRAULIC CONDUCTIVITY = .00000005 FT/MIN K = .00000002 CM/SEC

2ND P1/3 TEST TEST ABORTED

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/12/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 98.35 - 108.00
MATERIAL TESTED: ARAPAHOE CLAYSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST TEST ABORTED

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MINK = .00000004 CM/SEC

2ND P1/3 TEST TEST ABORTED

## PACKER TEST ANALYSIS WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 108.00 - 117.65
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

1ST P1/3 TEST TEST ABORTED

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000012 FT/MIN K = .00000006 CM/SEC

2ND P1/3 TEST TEST ABORTED

## PACKER TEST ANALYSIS WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02
DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 115.65 - 125.30
MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

 $K = \frac{Q}{2(PI)(L)(H)} \frac{L}{R}$ 

1ST P1/3 TEST

TEST ABORTED

P2/3 TEST

K = HYDRAULIC CONDUCTIVITY = .00000076 FT/MIN K = .00000039 CM/SEC

2ND P1/3 TEST

TEST ABORTED

## PACKER TEST ANALYSIS WELL NO. 39-87BR

ROCKY FLATS PLANT; SOLAR POND AREA JOB NO. 2029-17-02

DATE TESTED: 11/11/87 BY: KD HOLLIWAY
TEST INTERVAL (FEET BELOW G.S.): 122.68 - 132.33

MATERIAL TESTED: ARAPAHOE SANDSTONE
DEPTH TO WATER (FEET BELOW G.S.): 83.98

K = ----- LN(--)2 (PI) (L) (H) R

1ST P1/3 TEST

Q = INJECTION RATE = .00004344 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 10.15 + .00 \* 2.31 = 94.13

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000003 FT/MIN

K = .00000002 CM/SEC

P2/3 TEST

Q = INJECTION RATE = .00017377 (FEET3/MIN)

L = LENGTH OF TEST INTERVAL = 9.65 FEET

TEST INTERVAL IS BELOW WATER TABLE

HEAD = DEPTH TO WATER + GAGE HEIGHT

+ GAGE PRESSURE (IN FEET)

= 83.98 + 5.90 + 29.70 \* 2.31 = 158.49

R = BOREHOLE RADIUS = .17 FEET

K = HYDRAULIC CONDUCTIVITY = .00000007 FT/MIN

K = .00000004 CM/SEC

2ND P1/3 TEST

\_

TEST ABORTED

# ROCKY FLATS SOLAR PONDS WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK UP	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
3987	11/12/87	5947.10	5949.12	2.02	117.14	23.90	5925.22
	12/22/87					23.60	5925.52
	02/01/88					40.20	5908.92
	02/29/88					46.60	5902.52
	03/21/88					108.6	5840.52
	04/18/88					86.00	5863.12

Boring No.: SP09-87					
Completed as well? No					
Data in File					
X Log of Borehole					
Well Construction Summaries					
Well Development Summaries					
Hydraulic Conductivity Test Data and Results					
Packer Test Data and Results					
Water Level Data					
Saturated Thickness Hydrographs					

Location R	ocky Flats Plant; Solar	Ponds Area	
	* N 38144 E 21872		I No. <u>SP09-87</u> co Elevation *5945.0'
Total Depti			Encountered None
·			Static
Drilling Cor	mpany Boyles Bros.	Driller T I	ligh
	November 2, 1987		Keeney
	thod Hollow Stem Auger	•	
	R. Treat		
	Geologist	Checked by	Site Manager
Comments	Borehole backfilled wir	h Portland Type I Cement.	CEARP Manager
Comments	*Coordinates and elevat	ion estimated from topogr	aphic map.
_			
	Litt	nologic Description	Samples Collected o Other Tests Perform
— o	国国 /	TIFICIAL FILL/DISTURBED	
•	0.0-1.5' SAMPLE		
•	Recovered 1.3/1		
		tered gravels; low plastic; moist.	
•	1.5-3.0' SAMPLE	<u>.</u>	
	Recovered 1.1/1	.5' = 73%. : moderate yellowish brown (10 YR	HNu Background=0.3
	5/4): fine-grain	ned sand as noted above; moist.	OVA Background=0.0
<del>-</del> 5	gravels: varying	ND AND GRAVEL: few scattered g light brown to medium dark brown;	
	weakly cemente	ed; poorly sorted; rounded and vels ranging 0.75 mm to 4.25 mm;	0.0-1.3': Field screen
	quartzose compo	sition; light moist.	0.0(0.0); $OVA = 0.0(0.0)$ .
	3.0-6.0' SAMPLE	•	1.5-2.61: Field screen
	Recovered 2.1/3		readings: HNu = 0.0(0.0).
	(10 YR 5/4); m	oderately oxide stained; fine- and	
	medium grained	sand (2.5-2.0 Ø to 0.0-0.5 Ø); ded and rounded quartzite; weakly	
<del></del> 10	cemented; light	ly moist.	( 0 9 El. Contact
	light olive	Y: yellowish gray (5 YR 7/2) to brown (5 Y 5/6); moderately	sample: SP098706CT.
	calcareous; hig	ghly plastic; moderately cemented;	8.5-11.01: Bedrock
	↓ ↓ ↓	ARAPAHOE FORMATION	sample: SP098708BR.
			8.5-11.0': Field screen
	6.0-8.5' SAMPLE Recovered 3.5/2		reading: $HNu = 0.0(0.0)$ ; $OVA = 0.0(0.0)$ .
		dium gray (N 5/0); slightly oxide um plastic; blocky; weathered;	
	massive; moist.		
<del></del> 15	+ + + 8.5-11.0' SAMPL		
	Recovered 2.5/2 CLAYSTONE: s	2.5' = 100%. andy; medium gray (N 5/0); fine	.
	grained sand (	(3.5-3.0 Ø); low plastic; massive	;
	blocky; mode weathered; mois	rately oxide stained levels st.	;
	1 1 1	TOTAL DEPTH: 11.0'	
		TOTAL DEFIN. 11.0	
	+ + +		
<u> </u>			

Boring No.: SP10-87				
Completed as well? No				
Data in File				
X Log of Borehole				
Well Construction Summaries				
Well Development Summaries				
Hydraulic Conductivity Test Data and Results				
Packer Test Data and Results				
Water Level Data				
Saturated Thickness Hydrographs				

-					
			ds Area Boren	ole/Well !	No. SP10-87
Coordinates	* N 38185	E 21480	Groun	d Surface	Elevation *5941.0'
Total Depti	22.7'		Water	Level E	ncountered 21.0'
				S	tatic
Drilling Con	mpany <u>Bovl</u>	es Bros.	Drille	r R. Sh.	arp
Date Drille	• November	9-11, 1987	Helpe	T. Me	rritt
Drilling Mel	thod Hollow	Stem Auger	Drilli	ng Fluid .	None
Logged By	J. Bacchus			ked By	
	Geo	logist	000		Site Manager
				_	CEARP Manager
Comments	Borehole ba	ckfilled with P	ortland Type I	Cement.	
			estimated from		
_	<del></del>				
/3		• /			
0.4		Lithol	ogic Description		Samples Collected of Other Tests Perform
/ • •			•		/
-0.					
		ARTIF	ICIAL FILL/DISTURBED		
	<b>陸碧</b> /	0.0-2.0' SAMPLE. Recovered 1.8/2.0'	= 90%.		
		- CLAY: dark vellow	ish brown (10 YR 4/2	2) mottled	
		with dark yellowish sand: abundant root:	orange (10 YR 6/6); s at the top; caliche	; silt and ; moist.	0.0-1.8': Direct hit sample: SP1087000H.
		-			·
		2.0-4.0' SAMPLE. Recovered 1.9/2.0'			2.0-3.91: Direct hit sample: SP108702DH.
	[ ]	2.0-2.4': CLAY: s	ame as above.		
<del></del> 5		ARA	PAHOE FORMATION		4.0-5.01: Direct hit sample: SP1087048R.
		_ 2.4-3.9': CLAYSTO	NE: dark yellowish	orange (10	5.0-7.0!: Direct hit
		YR 6/6) mottled wi	ith very pale yellow pale olive (10 Y 6/	ish orange 2): sandv:	sample: SP108705DH.
		caliche; moist.	sale otive (10 1 of	-,,	7.0-9.0': Direct hit
		4.0-5.01 SAMPLE.			sample: SP108707DH.
		Recovered 1.6/1.01			9.0-11.0': Direct hit
		CLAYSTONE: same as	above; moist.		sample: SP1087090H.
10		5.0-7.0' SAMPLE. Recovered 2.2/2.0'	= 014		11.0-13.0': Direct hit
<del></del> 10	国 /	CLAYSTONE: same a	s above, except less	sand, less	sample: SP108711DH.
		caliche, and slight	tly less oxidation.		13.0-14.91: Direct hit
		7.0-9.0' SAMPLE.	_ 110%		sample: SP1087130H.
		Recovered 2.2/2.0' CLAYSTONE: Sa		cept more	
		consolidated; no ca	aliche; moist.		
		9.0-11.0' SAMPLE.			1
	+ <i>Y</i> /	Recovered 2.0/2.0' CLAYSTONE: Same as	= 100%. s above except moist '	to dry.	1
		11 0 17 01 014015	•	•	
<del>-</del> 15		11.0-13.0' SAMPLE. Recovered 2.0/2.0'	= 100%.		
	† <i>†</i> /		olive gray (5 Y 5/ sh orange (10 YR 6/		
			ne-grained sand; slig		
		13.0-15.0' SAMPLE.			
		Recovered 1.9/2.0'	= 95%.	/3\ ma**! ** <sup>1</sup>	
		with dark yellowi	olive gray (5 Y 5/ ish orange (10 YR 6	5/6); fine-	
	<b>翻</b>	grained; high amo	unt of clay; no HC		
20	1	dry.			

Location Rocky Flats Plant; Solar Ponds Area Borehole/Well	No. SP10-87(cont'd.)	
Coordinates Ground Surfac	e Elevation	
Total Depth Water Level	Encountered	
	Static	
Drilling Company Driller		
Date Drilled Helper		
——————————————————————————————————————		
Logged By Checked By	Site Manager	
Geologist	Site Manager	
Comments	CEARP Manager	
Lithologic Description	Samples Collected e Other Tests Perform	
20 1		
15.0-17.0' SAMPLE.		
Recovered 1.9/2.0' = 95%.  SANDSTONE: same as above except less clay, coarser sand; sand gets coarser at bottom.	15.0-16.9': Direct hit sample: SP108715DH.	
17.0-19.0' SAMPLE. Recovered 2.2/2.0' = 110%.	17.0-19.0': Direct hit sample: SP108717DH.	
CLAYSTONE: light olive gray (5 Y 5/2) and dark yellowish orange (10 YR 6/6); very sandy, fining downward; coarse sand at the top, clay at the	17.0-19.0': Duplicate sample: SP1087017D.	
bottom; dry.  19.0-21.0' SAMPLE.	19.0-21.0': Direct hit sample: SP1087190H.	
Recovered 2.2/2.0' = 110%.  CLAYSTONE: light olive gray (5 Y 5/2) mottled with dark yellowish orange (10 YR 6/6); HCl	21.0-23.0': Water table sample: SP108721WT.	
reaction in the dark yellowish orange areas only; dry.	22.7-23.7': Direct hit sample: SP108723DH.	
21.0-23.0' SAMPLE. Recovered 2.2/2.0' = 110%.	23.7-25.71: Direct hit	
+ 21.0-21.4': CLAYSTONE: same as above except some fine-grained sand and wet.	sample: SP108724DH.	
21.4-23.0': CLAYSTONE: light olive gray (5 Y 5/2); mottled with light yellowish orange; dry.		
Total depth of borehole measured 22.7'; adjust depth.		
22.7-23.7' SAMPLE. Recovered 2.0/1.0' = 200%.		
CLAYSTONE: same as above.		
23.7-25.7' SAMPLE. Recovered 2.0/2.0' = 100%.		
CLAYSTONE: same as above.		
- 35 + 25.7-27.7' SAMPLE.		
Recovered 2.2/2.0' = 110%.  CLAYSTONE: same as above, except a little less		
mottled.		
TOTAL DEPTH: 27.7'		
† † †		
+ + +		
<u> </u>	<b>Page 2 91</b> 2	

Boring No.: SP11-87					
Completed as well? No					
Data in File					
X Log of Borehole					
Well Construction Summaries					
Well Development Summaries					
Hydraulic Conductivity Test Data and Results					
Packer Test Data and Results					
Water Level Data					
Saturated Thickness Hydrographs					

Location R	ocky Flats F	lant; Solar Ponds Area	rehole/Well l	No. SP11-87
				Elevation *5904.5'
Total Depti	34.0'			ncountered None
				tatic
Drilling Cor	mpany Boyl	es Bros.	riller T. Hi	
	• November		B. Ke	
			rilling Fluid	None
	R. Treat	logist	hecked By	Site Manager
			_	CEARP Manager
Comments		ckfilled with Portland Type		
	*Coordinate	s and elevation estimated f	rom topograp	hic map.
· _	77			
/3		•		Samples Cellected o
		Lithologic Descript	ion	Other Tests Performe
	/0 1/41	/		
0				
•		ARTIFICIAL FILL/DISTURB	ED	
	<b>陸村/</b>	0.0-1.5' SAMPLE.		
•		Recovered 1.5/1.5' = 100%.		0.04.5152.14
		0.0-0.3': SANDY CLAY: dusky brown plastic; roots; fill; light moist.	(5 Y 2/2); low	0.0-1.5': Field screen reading: HNu = 0.0(0.0);
		0.3-1.5': CLAY: dark vellowish	orange (10 YR	OVA = 0.0(0.0).
		6/6); fine-grained sand with grav "subrounded and rounded; low p	et to 3.2 mm;   lastic: sandy;	1.5-3.51: Field screen
_		gravel; moderately oxide stained; l	ight moist.	reading: HNu = 0.0(0.0); OVA = 0.0(0.0).
<del>-</del> 5		1.5-3.5' SAMPLE.		
		Recovered 2.0/2.0' = 100%. CLAY: mixed brown and severely	oxide stained:	3.5-6.3': Field screen reading: HNu = 0.0(0.0);
		much noted claystone fragments and	some sandstone	OVA = 0.0(0.0).
	国ゴイ	<ul> <li>particles; fine-grained sand; we fill; moist.</li> </ul>	akly cemented;	0.0-8.5!: Composite
			•	sample: SP11870008.
		- <u>3.5-6.3' SAMPLE.</u> Recovered 3.2/2.8' = 114%.		6.3-8.5': Field screen
		SANDY CLAYSTONE: mixed oxide gravel; weakly cemented; low pla	stained brown;	readings: HNu = 0.0(0.0).
10		fragment of asphalt noted at approx		8.8·11.3': Readings on
<del>-</del> 10		6.3-8.8' SAMPLE.		core: HNu = 0; OVA =
		Recovered 2.2/2.5; = 88%.  CLAY: oxide stained brown to light	t arey and dark	13.5.
		brown; claystone fragments; sandy	to very sandy;	8.8-11.3': Direct hit
	国ゴノ	fine-grained; weakly cemented; moist.	massive; very	sample: SP118708DH.
	<b>其制</b> ,			11.5-14.0!: Readings on core: HNu = 0; OVA = 95.
	国 /	8.8-11.5' SAMPLE. Recovered 2.5/2.7' = 93%.		
	<b>養養</b>	- CLAY: brown to dusky brown (5 YR fragments; very much clay: few		11.5-14.0': Direct hit sample: SP118711DH.
		slightly sandy; small and medium	size scattered	
15	[ ]	gravel; weakly cemented; low to lenses; very moist.	medium plastic	
	世野ノ	•		
		11.5-14.0' SAMPLE. Recovered 2.5/2.5' = 100%.		
		CLAY: dark gray (N 4/0) to dark claystone fragments and clay w	gray (N 3/0);	
		gravel; varying gravel, rounded (	(1.75-2.50 mm);	
	展題/	medium plastic; moderately to we moist to very moist at bottom.	eakly cemented;	1
	<b>国新</b> /	The second secon		
20.				

Location Rocky Fl	lats Plant; Solar Ponds Area Borehole/Well	No. SP11-87(cont'd.)
Coordinates		Elevation
Total Depth		ncountered
		itatic
Drilling Company		
Logged By	Geologist Checked By	Site Manager
	-	CEARP Manager
Comments		· · · · · · · · · · · · · · · · · · ·
	'. / <b>*.</b> /	Samples Collected .
	Lithologic Description	Other Tests Perform
7 1 / 6 1	/•**/	
20 EEEE		
	14.0-16.5' SAMPLE. Recovered 1.1/2.5' = 44%.	14.0-15.1': Readings on
7-7-7-1 2020-000	14.0-14.5': CLAY: medium dark gray (N 4/0) to	core: HNu = 0; OVA = 95.
	Light gray (N 7/0) with some brown; claystone	14.0-15.11: Direct hit
	fragments; scattered gravel; slightly oxide stained; weakly cemented; highly plastic; moist.	sample: SP118714DH.
•	f <i>y</i> t	16.5-17.8': Readings on
	COLLUVIUM	core: HNU = 0; OVA = 76.
	14.5-15.1: CLAY: grayish black (N 2/0) to brownish black (5 YR 2/2); scattered gravel;	16.5-17.8': Direct hit
<b>—</b> 25	subrounded and subangular to 2.75 mm; slightly	sample: SP118716DH.
	sandy; fine-grained; slightly organic; low plastic; moist.	19.0-19.5': Readings on
	prastic, moist.	core: HNu = 0; OVA =
	16.5-19.0' SAMPLE. Recovered 1.3/2.5' = 52%.	310.
	16.5-17.0': CLAY: brownish black (5 YR 2/2);	<u>19.0-19.5'</u> : Direct
	scattered gravel; same as above. 17.0-17.8': CLAY: moderate yellowish brown (10	hit/upper contact sample: SP1187190H.
	YR 5/4) to grayish brown (5 YR 3/2); moderately	
	cemented; medium plastic; slightly sandy and moist.	21.5': Readings in augers: HNu = 0; OVA =
	T moist.	210.
30	$\frac{19.0 - 21.5' \text{ SAMPLE.}}{\text{Recovered } 0.5/2.5'} = 20\%.$	21.5-24.0': Readings on
	CLAY: mixed brown and gray; medium plastic;	core: HNu = 1.5; OVA =
	moderately cemented; slightly sandy; very fine- grained; little scattered gravel; moist.	98.
	granted, trette seattered gravet, morst.	21.5-24.0': Direct
	ARAPAHOE FORMATION	hit/contact sample: SP118721DH.
	21.5-24.0' SAMPLE.	
	Recovered 2.5/2.5' = 100%.  SANDSTONE: medium light gray (N 6/0) to medium	24.0-26.5': Readings on core: HNu = 0; OVA = 58.
	dark gray (N 4/0); moderately oxide stained brown;	
35	low plastic; fine-grained sand (3.0-2.5 0); poorly sorted; somewhat blocky and moist.	24.0-26.51: Direct hit/bedrock sample:
↓ .	1 1 '	SP118724DH.
	24.0-26.5' SAMPLE. Recovered 2.5/2.5' = 100%.	
+ .	+ CLAYEY SANDSTONE: noted lignite fragments; gray	
	as noted above; slightly to moderately oxide stained streaks; blocky; massive; low plastic;	
†	weakly cemented; fine-grained sand; moist.	1
1	1 1	
T		
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Coordinates Ground St  Total Depth Water Les  Drilling Company Driller Helper Drilling Method Drilling F	Well No. SP11-87 (cont'd.)  Inface Elevation  Vel Encountered  Static  Iuid  By  Site Manager  CEARP Manager
Lithologic Description	Samples Collected or Other Tests Performe
26.5-29.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: medium dark gray (N 4/0 dark gray (N 3/0); severely oxide stained streaks; low plastic; massive; somewhat bl moist.  29.0-31.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYEY SANDSTONE: medium dark gray (N 4/0) slight oxide staining; lignite particles scat about; fine-grained sand (3.0-2.5 0); low pla massive; weakly to moderately cemented; moist  31.5-34.0' SAMPLE. Recovered 2.5/2.5' = 100%. SANDSTONE/CLAYSTONE INTERRED-DED: dark gray (N 5/0) with slight moderate oxide stained lenses of light brown 5/6); fine-grained sand (3.0-2.5 0); massive; low to medium plastic; blocky; proceed sand; moist to light moist at bottom.	core: HNU = 0; OVA = 38.  26.5-29.01: Direct hit sample: SP118726DH.  29.01: Readings in augers: HNU = 0; OVA = 220.  stic; . 29.0-31.51: Direct hit sample: SP118729DH.  29.0-31.51: Readings in core: HNU = 0; OVA = 11.5.  11.5.  31.5-34.01: Field screen
TOTAL DEPTH: 34.01	

Boring No.: SP12-87
Completed as well? No
Data in File
X Log of Borehole
Well Construction Summaries
Well Development Summaries
Hydraulic Conductivity Test Data and Results
Packer Test Data and Results
Water Level Data
Saturated Thickness Hydrographs

Lastria Par	ales Flana Di			
		ant; Solar Ponds Area		
	* N 38635	E 21855		Elevation *5893.0'
Total Depth	46.5		Water Level E	ncountered 39.0'
			9	tatic
		Bros.		gh
	November 9-		Helper B. Kee	eney
		Stem Auger	Drilling Fluid	
Logged By	R. Treat		Checked By	
	Geol	gist		Site Manager
. 1	Borehole bad	efilled with Demale T		CEARP Manager
Comments -	*Coordinates	xfilled with Portland T and elevation estimate	ype I Cement. d from topograp	hic map.
/3				
		/ Lithologic Descr	inting	Sample's Collected of Other Tests Perform
\\ \sigma_{\begin{subarray}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\			.,,	/ Other lests Periorm
- 0 1				
		ARTIFICIAL FILL/DIST	URBED	·
**************************************		<u>.0-1.5' SAMPLE.</u> ecovered 1.0/1.5' = 67%.		100 - 2 - alcano metro 0
-		ANDY CLAY: moderate yellowish		HNu Background=0.0 OVA Background=0.2
Ħ		o dark yellowish orange (10 YR and (2.5-2.0 0); poorly sorted	6/6); fine-grained	Ludlum Background = 0.0
<b>1</b>		wist.	neukty cemented,	0.0-1.01: Field screen
		.5-3.5' SAMPLE.		readings: HNu = 0.0(0.0).
		ecovered 2.0/2.0' = 100%.		
— 5 <del> </del>		1.5-2.01: CLAY: moderate b slightly sandy; some small-size		1.5-3.5': Field screen readings: HNu =
Ē		ounded; moderately cemented; mo	ist.	0.0(0.0); OVA = 0.0(0.0).
Ţ		2.0-3.51: CLAY: medium gray ( prown of moderate yellowish by	(N 5/U) to varying : rown (10 YR 5/4);	3.5-6.51: Field screen
		fine-grained sand; weakly cemer		readings: HNu =
<u> </u>		fill; moist.		0.0(0.0); $OVA = 0.0(0.0)$ .
- <del>[</del>		3.5-6.5' SAMPLE. Recovered 3.0/3.0' = 100%.		0.0-9.0': Composite sample: SP12870009.
1		3.5-4.51: CLAY: light brown		
		and scattered gravel; moderate and medium-grained sand (1.5-1.0	y cemented; fine-	6.5-9.0': Field screen readings: HNu =
— 10 <del>{</del>		gravet ranging 1.50 mm; round	ded; low plastic;	0.0(0.0); OVA = 0.0(0.0).
į	(C) (C) (C) (C) (C) (C) (C) (C) (C) (C)	noist. 4.5-6.51: CLAY: medium gr	ay (N 5/0); low	9.0-11.5!: Field screen
1		plastic; sandy (3.0-2.5 0); wea	kly cemented; some	readings: HNu =
4		thin clay pockets; poorly sort oxide stained; weathered; cla	ed sand; slightly lystone fragments;	0.0(0.0); OVA = $0.0(0.0)$ .
-		moist.		11.5-14.0': Field screen readings: HNu =
1	選ばす	6.5-9.0' SAMPLE.		0.0(0.0); OVA = 0.0(0.0).
1		Recovered 2.5/2.5' = 100%. SAND AND CLAY: very pale oran	one (10 YP 8/2) to	14.0-16.5': Field screen
		medium light gray (N 6/0) and me	edium gray (N 5/0);	readings: HNu =
<del></del> 15 <del> </del>		blotchy; weakly cemented; low pi	astic; moist.	0.0(0.0); OVA = 0.0(0.2).
1		9.0-11.5' SAMPLE.		9.0-16.51: Composite
		Recovered 2.5/2.5' = 100%. CLAY AND SAND: moderate yello	owish brown (10 YR	sample: SP12870916.
4		5/4) to dark gray (N 3/0) to me	dium light gray (N	
ļ		6/0); noted 0.4' lense of approximately 10.8-11.2' with g		
†		weakly cemented; fine- and m lenses; moist.		
		tenoca; morat.		
1				
<u> </u>				1

Coordinates Total Depth  Drilling Company Date Drilled  Drilling Method  Logged By  Geo  Comments	Driller Helper Drilling Fluid	Site Manager CEARP Manager
20	Lithologic Description	Samples Collected or Other Tests Performe
- 25 - 30	11.5-14.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY: grayish brown (5 YR 3/2) to dark yellowish brown (10 YR 5/4); small (1.50 mm) gravel; rounded; claystone fragments medium dark gray (N 4/0); low plastic; weakly to moderately cemented; scattered gravels and claystone; moist.  14.0-16.5' SAMPLE. Recovered 3.2/2.5' = 128%. CLAY: some claystone lenses; as noted above for colors with small and medium scattered gravel (1.25 mm to 3.4 mm); rounded, subrounded, and subangular; slightly sandy; moderate to low plasticity; few scattered roots noted; moist.  16.5-19.0' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY: mixed brown to varying gray; with claystone fragments; scattered gravel; slightly to moderately oxide stained; medium to low plastic; slightly sandy to sandy lenses; fine- and medium-grained; moist.  19.0-21.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAY: multi-colored brown and gray; with some claystone fragments; noted organic lense at 21.0-21.4'; dusky brown (5 YR 2/2); numerous roots; low to medium plastic; weakly cemented; light moist to moist.  21.5-24.0' SAMPLE. Recovered 2.5/2.5' = 100%. 21.5-21.8': CLAY: varying brown; medium- and large-size gravel (3.50 mm); moist.  COLLUVIUM  21.8-24.0': CLAY: dusky brown (5 YR 2/2) to brownish black (5 YR 2/2); scattered gravel (1.50 mm); rounded and subrounded; much roots noted; low plastic; sand (3.5-3.0 0); light moist to moist.	16.5-19.0': Readings on core: HNu = 0; OVA = 6.8.  16.5-19.0': Direct hit sample: SP1287160H.  19.0-21.5': Readings on core: HNu = 6.8; OVA = 132.  19.0-21.5': Direct hit sample: SP1287190H.  21.5-24.0': Readings on core: HNu = 0; OVA = 76.  21.5-24.0': Direct hit sample: SP1287210H.

		Elevation
		Static
Drilling Company		
Date Drilled		
Logged By	Geologist Checked By	Site Manager
	_	
Comments		CEARP Manager
	Lithologic Description	Samples Collected of Other Tests Perform
40	<del>/</del>	
	24.0-26.5' SAMPLE. Recovered 1.2/2.5' = 48%. SAND: moderate yellowish brown (10 YR 5/4) to	24.0-25.21: Readings on core: HNu = 0; OVA = 124.
11	light brown (5 YR 5/6) and little dark yellowish orange (10 YR 6/6); slightly clayey to very clayey with gravel; well sorted sand ranging (2.0-1.5 0	24.0-25.2': Direct hit sample: SP128724DH.
$\downarrow \downarrow$	to 0.5-1.0 0); subrounded; rounded; and few subangular gravels ranging 1.25 mm to 3.75 mm and larger; weakly cemented; light moist.	<u>26.5·27.3'</u> : Readings on core: HNu = 0.0; OVA = 125.
- 45 J	26.5-29.0' SAMPLE.  Recovered 0.8/2.5' = 32%.  CLAY: varying brown to medium gray (N 5/0);  slightly sandy with small scattered gravels;	26.5-27.31: Direct
	medium plastic; slightly calcareous; moderately plastic; moist.	hit/upper contact sample: SP128726DH. 29.0-31.5': Readings on
. ]	29.0-31.5' SAMPLE. Recovered 2.5/2.5' = 100%.	core: HNu = 0; OVA = 38.
+ +	29.0-29.7': SANDY CLAY: pale brown (5 YR 5/2) to moderate yellowish brown (10 YR 5/4); slightly oxide stained; fine-grained sand (3.0-2.5 0); weakly cemented; low plastic; light moist.	29.0-31.5': Direct hit/contact sample: SP1287290H.
— <sub>50</sub> †	ARAPAHOE FORMATION	31.5-32.21: Readings on core: HNu = 0; OVA = 72.
<b>† †</b>	29.7-31.5': SANDY CLAYSTONE: medium light gray (N 6/0) to medium dark gray (N 4/0); fine-grained sand (3.5-3.0 0); massive; blocky; low plastic; weakly to somewhat moderately cemented; weathered;	31.5-32.2': Direct hit/bedrock sample: SP128731DH.
† †	31.5-34.0' SAMPLE.	34.0-34.51: Readings on core: HNu = 0; OVA = 78.
_ 55	Recovered 0.7/2.5' = 28%.  CLAYSTONE: medium gray (N 5/0) to dark gray (N 3/0); medium plastic; slightly oxide stained;  massive: slightly sandy: weathered: moist.	34.0-34.5': Direct hit sample: SP128734DH.
+ +	34.0-36.5' SAMPLE.  Recovered 0.5/2.5' = 20%.	39.0-41.0': Readings on core: HNu = 0; OVA = 22.
+ +	SANDY CLAYSTONE: same as above.	
1 1	36.5-39.0' SAMPLE. Recovered 0.0/2.5' = 0%.	
1 1		

Comments	Water Level Encountered	
10 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ogic Description	Samples Collected or Other Tests Performe
Recovered 2.0/2.0' SANDSTONE: medium (N 3/0); slightty influence; fine-g cemented; weathered  41.5-44.0' SAMPLE Recovered 2.5/2.5' SANDSTONE: vary grayish brown (5' only moderately slightly oxide st to moderately ceme  44.0-46.5' SAMPLE Recovered 2.5/2.5' SANDSTONE: clay grayish brown (5' cemented; fine-grayish brown (5' cemented; fine-gray); poorly sorted	T = 100%.  In dark gray (N 4/0) to dark gray  y oxide streaked; much lignite  rained sand (3.0-2.5 0); weakly  ed; light moist.  T = 100%.  ring pale brown (5 YR 5/2) to  YR 3/2) to dark gray (N 3/0); now  influenced with lignite seams;  rained; fine-grained sand; weakly  ented; weathered; light moist.	39.0-41.0': Direct hit sample: SP1287390H.  41.5-44.0': Readings on core: HNu = 0; OVA = 8.8.  41.5-44.0': Direct hit sample: SP128741DH.  44.0-46.5': Readings on core: HNu = 0; OVA = 0.  44.0-46.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).

Boring No.: SP13-87				
Completed as well? No				
Data in File				
X Log of Borehole				
Well Construction Summaries				
Well Development Summaries				
Hydraulic Conductivity Test Data and Results				
Packer Test Data and Results				
Water Level Data				
Saturated Thickness Hydrographs				

ocation Rocky Flats Plant; Solar Ponds Area Borehole/Well	io. <u>SP13-87</u>
	Elevation *5925.01
Total Depth 16.5' Water Level E	ncountered None
	tatic
Drilling Company <u>Boyles Bros</u> . Driller <u>T. His</u>	
Date Drilled November 6. 1987 Helper B. Kee	eney
Drilling Method Hollow Stem Auger Drilling Fluid	None
Logged By R. Treat Checked By	
Geologist	Site Manager
Comments Borehole backfilled with Portland Type I Cement.	CEARP Manager
*Coordinates and elevation estimated from topograp	hic map.
Lithologic Description	Samples Collected
Lithologic Description	Other Tests Perform
ARTIFICIAL FILL/DISTURBED	
0.0-1.5' SAMPLE.	
Recovered 1.5/1.5' = 100%. 0.0·1.3': SAND grayish orange (10 YR 7/4);	
silty and slightly clayey; fine-grained sand (3.5.	
3.0 0); weakly cemented; poorly sorted with upper 0.2' organic with many roots noted; light moist.	
ROCKY FLATS ALLUVIUM	
1.3-1.5': CLAY: grayish brown (5 YR 3/2);	
moderately cemented; medium plastic; some scattered gravel; lightly moist.	HNu Background=0.8 OVA Background=3.2
1.5-3.5' SAMPLE.	Ludlum Background = 0.0
Recovered 2.0/2.0' = 100%. 1.5-2.7': CLAY: grayish brown (5 YR 3/2); moderately to highly cemented; medium plastic;	0.0-1.51: Upper contact sample: SP138700UC.
slightly sandy; very fine-grained; moist.  ARAPAHOE FORMATION	1.5-3.5!: Contact sample taken: SP138701CT.
2.7-3.5': SANDY CLAYSTONE: medium light gray (N 6/0); low plastic; massive; blocky; fine-grained	3.5-6.5': Bedrock sample taken: SP138703BR.
sand (3.5-3.0 0); weathered; moist.  3.5-6.5' SAMPLE.	6.5-9.0': Direct hit sample: SP138706DH.
Recovered 3.0/3.0' = 100%. SANDY CLAYSTONE: medium dark gray (N 4/0); fine-grained sand (3.5-3.0 0); massive; just slightly	6.5·9.0': Duplicate sample: SP13876DUP.
oxide stained; blocky; medium plastic; moderately cemented; weathered; moist.	9.0-11.51: Direct hit sample: SP138709DH.
6.5-9.0' SAMPLE.  Recovered 2.5/2.5' = 100%.	
CLAYSTONE: sandy to very sandy as noted in previous run; medium to low plastic; weakly cemented; slightly to moderately oxide stained;	
weathered; moist.	
9.0-11.5' SAMPLE.  Recovered 2.5/2.5' = 100%.	
9.0-9.2': SANDY CLAYSTONE: as noted above. 9.2-11.5': CLAYEY SANDSTONE: medium light gray	
+ + (N 6/0) to moderately and severely oxide stained	
brown of dark yellowish orange (10 YR 6/6) to moderate yellowish brown (10 YR 5/4); weakly to moderately cemented; fine-grained sand (3.0-2.5	

Coordinates  Fotal Depth  Drilling Company  Date Drilled  Drilling Method	Geologist	Ground Surface Water Level  Driller Helper Drilling Fluid	Site Manager  CEARP Manager
4100 Y	Litholo	gic Description	Samples Collected of Other Tests Performe
- + + + + + + + + + + + + + + + + + + +	11.5-14.0' SAMPLE. Recovered 2.5/2.5' = 11.5-13.5': SANDST lenses; color as st (3.0-2.5 0); weakly stained; moist; 13.5-14.0': CLAYSTO slightly sandy; mas fine-grained sand; p moist.  14.0-16.5' SAMPLE. Recovered 2.5/2.5' = CLAYSTONE: medium gray (N 4/0); slight slight oxide stain	TONE: clayey to very clayey tated above; fine-grained sand y cemented; moderately oxide ONE: medium dark gray (N 4/0); sive; medium plastic; blocky; poorly sorted; weathered; light	11.5-14.0': Direct hit sample: SP138711DH.  14.2': Readings in augers: HNu = 14.2' OVA = 0.0.  14.0-16.5': Field screen readings: HNu = 0.0(0.0); OVA = 0.0(0.0).
- + +	- +	L DEPTH: 16.5'	
+ -			
+ -	+ +		

Boring No.: SP14-87			
Completed as well? No			
Data in File			
X Log of Borehole			
Well Construction Summaries			
Well Development Summaries			
Hydraulic Conductivity Test Data and Results			
Packer Test Data and Results			
Water Level Data			
Saturated Thickness Hydrographs			

Location Rocky Flats Plant; Solar Ponds Area  Coordinates * N 38622 F 22328  Total Depth 7.0'  Drilling Company Boyles Bros.  Date Drilled November 11 and 12, 1987  Drilling Method Hollow Stem Auger  Logged By R. Treat  Geologist	Ground Surface Elevation Water Level Encountere Static  Driller T. High Helper B. Keeney Drilling Fluid None Checked By	*5890.0'  Mone  None
Borehole backfilled with Portland *Coordinates and elevation estimates **Coordinates and elevation estimates **Lithologic Documents**	Type I Cement. ed from topographic map.  Sample	ARP Manager  S Cellected o
ARTIFICIAL FILL/D  O.O-2.0' SAMPLE. Recovered 0.4/2.0' = 20%. CLAY: dusky brown (5 YR 2/2) gravel; low plastic; weakly organic in upper 0.4'; with recovered 2.0/2.0' = 100%. 2.0-4.0' SAMPLE. Recovered 2.0/2.0' = 100%. 2.0-3.2': CLAY: dark yell 6/6) to moderate yellowish brown to medium plastic; scatterecemented; moist.  ARAPAHOE FORM  3.2-4.0': CLAYSTONE AND SAN gray (N 4/0) to dark gray (N 4/0) to dark gray (N 4/0) to plastic; weathered; poorly sorted; fir 2.5 0); low plastic; weathered 4.0-7.0' SAMPLE. Recovered 3.0/3.0' = 100%. SANDY CLAYSTONE: medium dark plastic; blocky; slightly ox and slightly calcareous let grained sand (3.5-3.0 0); cemented; weathered; moist.  TOTAL DEPTH:	slightly sandy with emented; moist; very ots.  HNU Backgro OVA Backgro OVA Backgro Ludlum Back ov (10 YR 5/4); low i gravel; moderately  NITION  DISTONE: medium dark by (N 3/0); weakly e-grained sand (3.0-i; light moist.  gray (N 4/0); medium de stained; streaked sed; massive; fine-grakly to moderately	cund=0.0 (ground = 0.0  Upper contact 148700UC (VOAs  Field screen HNu = DVA = 0.0(0.0).  Contact 148702CT.  Bedrock sample
- 15		

Boring No.: SP15-87				
Completed as well? No				
Data in File				
X Log of Borehole				
Well Construction Summaries				
Well Development Summaries				
Hydraulic Conductivity Test Data and Results				
Packer Test Data and Results				
Water Level Data				
Saturated Thickness Hydrographs				

Location Rocky Flats Plant: Solar Ponds Area Borehole/Well No. SP15-87 Coordinates : \* N 38273 E 22674 Ground Surface Elevation . \*5927.01 Total Depth 19.5 Water Level Encountered 12.3' Static \_ Drilling Company Boyles Bros. Driller T. High Helper B. Keeney Date Drilled November 12 and 13, 1987 Drilling Method Hollow Stem Auger Drilling Fluid None Logged By R. Treat Checked By \_\_\_\_ Geologist Site Manager CEARP Manager Comments Borehole backfilled with Portland Type I Cement. \*Coordinates and elevation estimated from topographic map. ( O' \*\*\* ( ) ... /\*\*\*\*/ = ... ,,,• Samples Collected or Lithologic Description Other Tests Performed ARTIFICIAL FILL/DISTURBED 0.0-2.0' SAMPLE Recovered 1.5/2.0' = 75%. HNu Background=0.0 CLAY: dark yellowish orange (10 YR 6/6) to OVA Background=0.0 moderate brown (5 YR 4/4) and light brown (5 YR Ludlum Background = 0.0 5/6) to medium gray (N 5/0); claystone pieces; sandy with scattered gravel; rounded and subrounded; quartzite composition; low plastic; 0.0-1.51: Field screen readings: HNu = weakly cemented; light moist to moist lensed.  $0.0(0.\overline{0})$ ; OVA = 2.2(2.7). 2.0-4.01 SAMPLE. 2.0-2.81: Direct hit - 5 Recovered 0.8/2.0' = 40%. sample: SP158702DH. CLAY: with claystone and sandstone; colors varying as stated above with scattered gravel; 2.0-2.81: Readings on weakly cemented; fine-grained sand; light moist. core: HNu = 0; OVA = 12.5. 4.0-7.0' SAMPLE. Recovered 0.4/3.0' = 13%. 4.0-4.41: Readings on CLAY: with claystone and some scattered gravel; core: HNu = 0; OVA = multi-colored brown to gray; low plastic; weakly cemented; subrounded and rounded gravel; light 4.85. 4.0-4.4': Direct hit sample: SP158704DH (VOAs 7.0-8.0': No recovery. Drilled with center bit. only). - 10 8.0-10.0' SAMPLE. 8.0-10.01: Readings on Recovered 2.0/2.0' = 100%. core: HNu = 0; QVA = 44. CLAY: light brown (5 YR 6/4) to moderate yellowish brown (10 YR 5/4) and grayish brown (5 8.0-10.01: Direct hit YR 3/2); slightly sandy to very sandy lensed; fine-grained sand (3.5-3.0 0); weakly to sample: SP158708DH. moderately cemented; low to medium plastic; 8.0-10.01: Duplicate scattered gravel to 2.75 mm; rounded; soil very organic in composition and smell; moist. sample: SP1587008D. 10.0-12.01: Readings on ROCKY FLATS ALLUVIUM core: HNU = 0; OVA = 28. 10.0-12.0' SAMPLE. 15 10.0-12.0': Direct hit Recovered 2.0/2.0' = 100%. 10.0-10.5': CLAYEY SAND: light brown (5 YR 5/6); sample: SP158710DH. scattered gravel; fine-grained sand (2.5-2.0 Ø to 2.0-1.5 0); rounded gravel; weakly cemented; 12.01: Readings in augers: HNu = 0; OVA = moist. 10.5-11.5': CLAY: light gray (N 7/0) to light olive gray (5 Y 5/2) and pale brown (5 YR 5/2); slightly organic; moderately cemented; moist. 11.5-12.01: CLAY: very sandy; moderate brown (5 YR 4/4) to moderate yellowish brown (10 YR 5/4); fine-grained sand (3.5-3.0 0); moderately cemented; low plastic; moist. o f

Comments  Cocation Rocky Flats Plant; Solar Ponds Area  Coordinates  Cotal Depth  Drilling Company  Date Drilled  Drilling Method  Comments		Borehole/Well NoSP15-87 (cont.d. Ground Surface Elevation	
	Lithologic Desc	cription	Samples Collected or Other Tests Performe
	12.0-14.5' SAMPLE.  Recovered 2.5/2.5' = 100%.  SAND: moderate yellowish bridark yellowish orange (10 YR 6 7/0) and medium gray (N 5/0), clayey to very clayey; sand cemented; wet approximately 12 moist.  14.5-17.0' SAMPLE.  Recovered 2.5/2.5' = 100%. 14.5-14.9': SAND: very coprevious run.	/6) to light gray (N , streaked; slightly (2.5-2.0 0); weakly 2.0-12.31, then very	12.0-14.5': Readings on core: HNu = 0; OVA = 2.2.  12.0-14.5': Water table; upper contact; direct hit sample: SP158712WT.
	ARAPAHOE FORMA  14.9-17.0': SANDY CLAYSTONE: 5/6) to predominantly medium weathered; moderately oxide plastic; massive; fine-graine blocky; weakly to moderately oxide  17.0-19.5' SAMPLE. Recovered 2.5/2.5' = 100%. CLAYSTONE: medium light graine	light brown (5 YR light gray (N 6/0); e stained; medium d sand (3.5-3.0 0); emented; moist.	14.5-17.0': Contact sample: SP158714CT.  17.0-19.5': Bedrock sample: SP158717BR.
	dark gray (N 4/0); weathered; blocky; massive; medium procemented; moist.  TOTAL DEPTH:	plastic; moderately	
+ + + + + + + + + + + + + + + + + + + +	+		

Boring No.: 56-87/SP16-87				
Completed as well? Yes				
Data in File				
X Log of Borehole				
X Well Construction Summaries				
X Well Development Summaries				
Hydraulic Conductivity Test Data and Results				
Packer Test Data and Results				
X Water Level Data				
Saturated Thickness Hydrographs				

ocation R	ocky Flats Plant; Solar Pond Area	Borehole/Well	No. <u>56-87/SP16-87</u>
Coordinates	N 37654.23 E 21319.10		Elevation <u>5978.51</u>
Total Depth	13.40'		ncountered None
		5	Static
Drilling Con	npany Boyles Bros.	Driller T. His	
	January 7, 1988	Helper B. Kee	
	hod Hollow Stem Auger	Drilling Fluid	
	KD Holliway		
	Geologist	Checken by	Site Manager
		_	CEARP Manager
Comments			
	Lithologic Desc	cription	Samples Collected or Other Tests Performe
0	/ 6 4 / 6 K /		
	TOP SOI 0.0-2.0' SAMPLE. Recovered 2.0/2.0' = 100% 0.0-0.5': TOP SOIL: va	%. ried greens and	HNu background=1.2. OVA Bachground=1.6 Ludlum background = 0.0
5	browns; grass and ice; su up to 1" diameter; sandy <u>ARTIFICIAL FILL/</u>	clay; frozen.	0.0-2.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.9 (1.2).
	0.5-1.1': CLAYEY SANI brown (10 YR 6/2) to brown (10 YR 4/2); ve. (2.0-1.5 Ø to 1/4"), poor subrounded to angular; gravel up to 1" diameter	o dark yellowish ry coarse-grained orly sorted sand; small quartzite	0.0-2.0': Field screen sample: SP168702FS.  2.0-3.5': Field screen readings: HNu = 1.2 (1.2); OVA = 1.2 (1.2).
<u>10</u>	moist to frozen. 1.1-2.0': SANDY CLAY: (5 YR 3/4); some ver poorly sorted, subroun sand; angular quartzite	y coarse-grained, ided to angular gravel up to 3"	4.0-6.0': Field screen readings: HNu = 1.6 (1.6); OVA = 1.2 (1.2).
	diameter; varied green orange to red staining damp.		6.0-8.0': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0).
_15	+ + +		tact sample: SP168708UC.
_20			sample:SP168710CT  11.2-13.4': Field screen readings: HNu = 1.2 (1.2); OVA = 1.0 (1.0).

Coordinates Total Depth Drilling Comp Date Drilled Drilling Meth	N 37654.23 E 21319.1  13.40'  Peny Boyles Bros.  January 7, 1988  de Hollow Stem Auger  KD Holliway  Geologist	Ground Surface Elevation <u>5978.51'</u> Water Level Encountered <u>None</u> Static			
	Litho	ologic Description	Samples Collected or Other Tests Performs		
	brown (5 YF orange (10 Y orange (10 Y reddish brow sand zones; sorted sand, quartzite gradular diameter; with medium				
- +	4.0-6.0' SAMP Recovered 2.0 SANDY CI brown (10 Y brown (10 Y gray (5 Y 7/ of core; suba gravel up to core; quartzi rounded to	LE.  2/2.0' = 100%.  2AY: moderate yellowish			
+	diameter; po	o coarse-grained up to 1/4" orly sorted; unconsolidated; increases down core; damp			

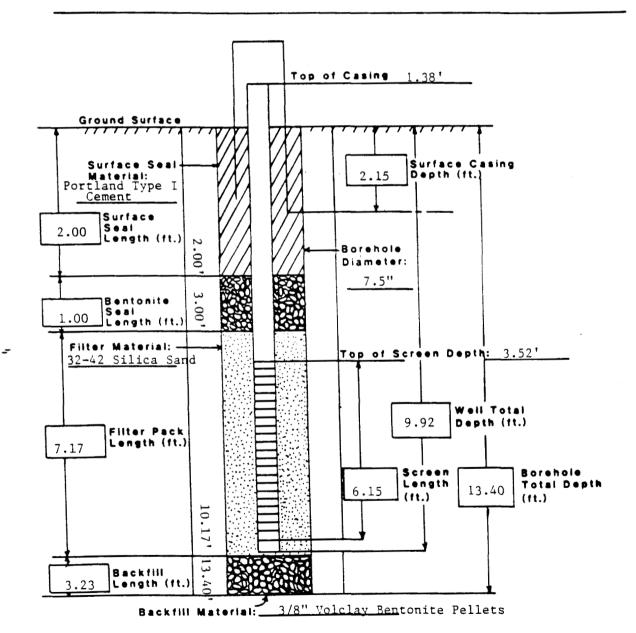
### OF BOREHOLE

Location Rocky Flats Plant; Solar Pond Area	Borehole/Well No. 56-87/SP16-87 (cont
Coordinates N 37654.23 E 21319.10	Ground Surface Elevation 5978.51'
Total Depth 13,40'	Water Level Encountered None
	Static
Drilling Company Boyles Bros.	Driller T. High
Date Drilled January 7, 1988	Helper B. Keeney
Drilling Method Hollow Stem Auger	Drilling Fluid None
Logged By KD Holliway	Chastad By
Geologist	Checked By
	CEARP Manager
Comments	
Lithologic Doe	Semples Cellected or Other Tests Performe
6.0-8.0' SAMPLE.	
Recovered $2.0/2.0' = 100$	0%.
6.0-6.3':GRAVEL: angula	
† † fine-grained sand; dry.	
$\frac{1}{1}$ $\frac{1}{1}$ $\frac{6.3-7.0}{1}$ CLAYEY SANI	
Y 6/4) to yellowish gra	
grained (2.5-2.0 Ø); fa	
1 1 1 -	caliche (strong
reaction to HCl); damp	` 51
1 7.00-8.00': CLAYEY	
GRAVEL: yellowish gr	
light brown (5 YR 5, reddish brown (10 R 4	
grained (2.5-2.0 Ø) t	
poorly sorted, subround	
sand; subangular grave	~ 1
unconsolidated; moist.	·
SO 10 O' SAMPLE	
8.0-10.0' SAMPLE, Recovered 0.0/2.0' = 0%	
Lost core.	
ARAPAHOE FO	RMATION
Q/Ka contact estima	ted at 0.40° by
drilling and cuttings.	teu at 9.40 by
_	
10.0-11,2' SAMPLE.	
Recovered $1.8/1.2' = 150$	0%.
SANDY CLAYSTONE:	i i
$T = \frac{1}{1} \sum_{i=1}^{n} \frac{1}{2} $ Y 5/2) to yellowish gra	ay (5 Y 7/2) with
dark yellowish orange	
staining; very fine-g	
grained sand; some cal damp.	icue; consolidated;

Location Re	ocky Flats	Plant; Solar Pond	Area Borehole/We	II No. 56-87/SP16-87 (cont'
		23 E 21319.10		ce Elevation 5978.51'
Total Depth	13.40'			Encountered None
		··		Static
		es Bros.	Driller T.	
Date DrilledJanuary 7, 1988			Helper B.	Keeney
Drilling Met	hod Hollow	Stem Auger	Drilling Fluid	None
Logged By	KD Holl	<u>iway</u>	Checked By	Site Manager
	Geo	plogist		Site Manager
_				CEARP Manager
Comments				
_	<del></del>			
0.4				Samples Collected or
0.4		Lithologi	c Description	Other Tests Performed
		<u>/</u>		
		11.2-13.4' SAMPLE Recovered 2.2/2.2'		
4	+ + +		CONE: same as abov	ve
		with occasional ir		
	† † †	TOTAL	DEDELL 13 40)	
-	+ + +	TOTAL	DEPTH: 13.40'.	
<del></del> -	1 1 1			
•	† † -	-		
	↓ ↓ ↓	•		
•	† † -	•		
•	↓ ↓ -			-
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#### WELL COMPLETION INFORMATION

Location Rocky Flats Plant; Solar Ponds Area Well No. \_\_56-87/SP16-87 Coordinates N 37654.23 E 21319.10 Elevation: Ground Surface 5978.51' Total Depth: Well \_\_9.92' Borehole \_\_13.40' Formation of Completion Rocky Flats Alluvium Casing Material Sch 5, Type 316, TFJ Stainless Casing Diameter 2" ID Steel Type 316, TFJ Stainless Steel Screen Material().010" wire wrap. Surface Casing Diameter \_\_\_\_5" ID\_ Date installed January 8, 1987 Approved By Site Manager Installed By K.D. Holliway Geologist CEARP Manager Comments



## WELL DEVELOPMENT SUMMARY SHEET

DATE	TIME	METHOD	VOLUME	APPEARANCE	COMMENTS
1/14/88	0800	Pumping			Water level O' before pumping; Water level O' after pumping.
					Hole depth: 10.3'
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#### ROCKY FLATS SOLAR PONDS

#### WATER LEVEL SUMMARY

WELL NUMBER	DATE	GROUND SURFACE ELEVATION	TOP OF CASING ELEVATION	STICK	DEPTH OF SI BASE	WATER DEPTH BELOW TOC	WATER SURFACE ELEVATION
5687	02/29/88 03/21/88	5978.51	5979.89	1.38	9.67	6.70 7.80	5973.19 5972.09
	04/18/88					6.70	5973.19